



2013-2014 WPC Winter Weather Desk Operations and Verification



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Keith Brill , David Novak , Wallace Hogsett, and Chris Bailey



Weather Prediction Center - Winter Weather Operations

- **Review of Winter Weather Desk Operations**
- **Changes to Operations for 2013-14 season**
- **Verification Review for 2012-13 season**
- **Benefits of Collaboration - Feb 2013 Case Study**
- **Experimental forecasts for 2013-14 season**

Current WPC Winter Weather Operations

NOAA NWS NCEP WPC INTERNAL WINTER WEATHER ACCUMULATIONS PAGE - Mozilla Firefox

File Edit View History Bookmarks Tools Help

+ Inbox - dan.petersen@noaa.gov - Natio... qpf shift help

NOAA NWS NCEP WPC INTERNAL WINT...

National Weather Service - NWS San Diego

HPC Product and Model Status Dashboard

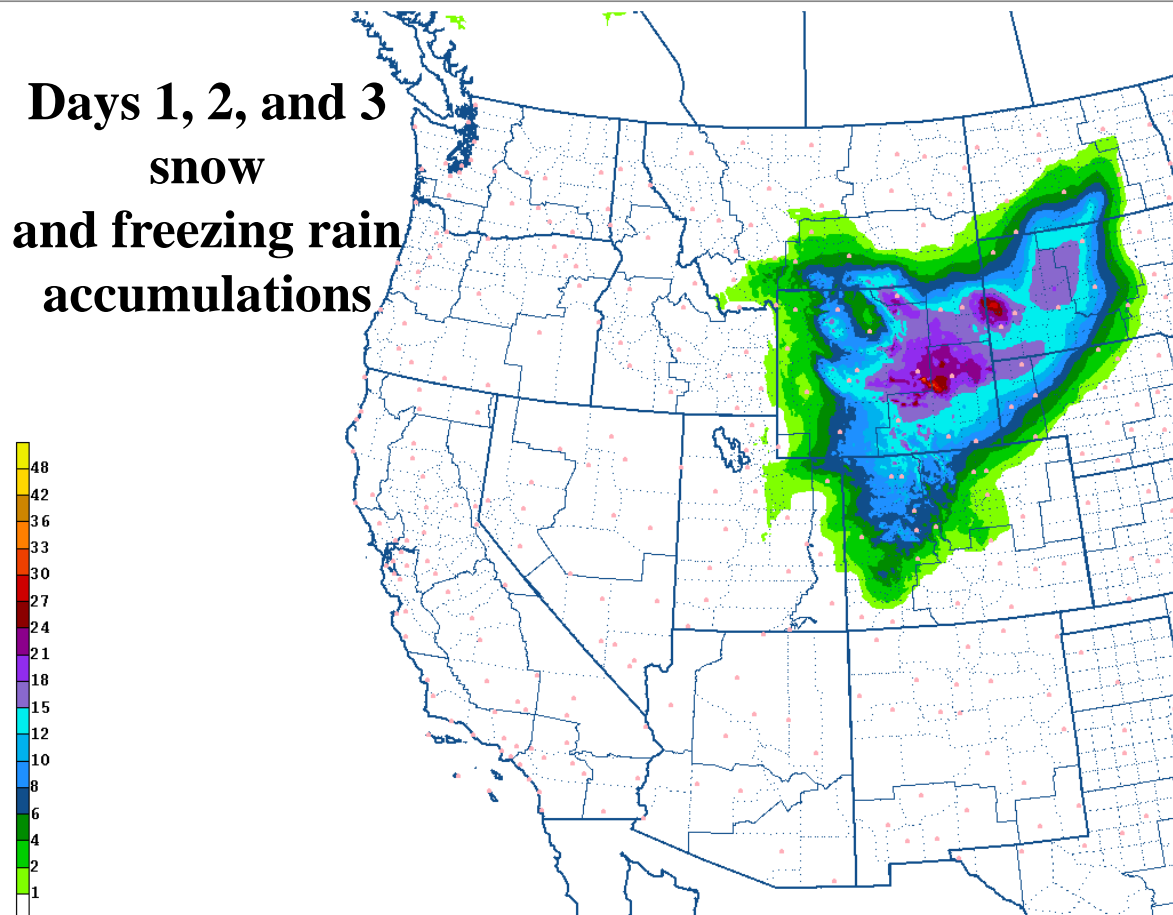
NOHRSC Interactive Snow Information

www.wpc.ncep.noaa.gov/wwd/internal/

Google

Gmail: Email from Goo... LWX MADIS Surface Data ... NWS GIS Data Links ONRFC - Google Maps... HPC QPF (origin) HPC Quick Reference ... MesoWest Data OUN WRF Experimental LSR Goo...

Days 1, 2, and 3
snow
and freezing rain
accumulations



IM - Day 1+2+3 WPC WWD PRISM Adj S/I/P accum (in) valid 00Z MON OCT-07-2013 (issued Thu 10/03/13 1810Z)
(dots=1st order obs sites)

WPC PRELIMINARY WINTER WEATHER ACCUMULATIONS

INTERNAL USE ONLY

[Latest Model Blend Summary](#)

SNOW/SLEET



FREEZING RAIN

AREA: ☐ CONUS ☐ IM ☐ Non IM

S&I/P/ZR Combo	S&I/P	ZR
<input type="radio"/> Day 1 (24-h accumulation)	<input type="radio"/> Latest <input type="radio"/> previous	<input type="radio"/> Latest <input type="radio"/> previous
<input type="radio"/> Day 1½ (24-h accumulation)	<input type="radio"/> Latest <input type="radio"/> previous	<input type="radio"/> Latest <input type="radio"/> previous
<input type="radio"/> Day 2 (24-h accumulation)	<input type="radio"/> Latest <input type="radio"/> previous	<input type="radio"/> Latest <input type="radio"/> previous
<input type="radio"/> Day 2½ (24-h accumulation)	<input type="radio"/> Latest <input type="radio"/> previous	<input type="radio"/> Latest <input type="radio"/> previous
<input type="radio"/> Day 3 (24-h accumulation)	<input checked="" type="radio"/> Latest <input type="radio"/> previous	<input type="radio"/> Latest <input type="radio"/> previous
<input type="radio"/> Day 1+2 (48-h accumulation)	<input type="radio"/> Latest <input type="radio"/> previous	<input type="radio"/> Latest <input type="radio"/> previous
<input type="radio"/> Day 2+3 (48-h accumulation)	<input type="radio"/> Latest <input type="radio"/> previous	<input type="radio"/> Latest <input type="radio"/> previous
<input type="radio"/> 3 Day Total (72-h accumulation)	<input type="radio"/> Latest <input type="radio"/> previous	<input type="radio"/> Latest <input type="radio"/> previous
<input type="button" value="Display Forecast"/>		

ZOOM - Zoom button, then repeat **LEFT** click

UNZOOM - Click the Un-Zoom button

PAN - Drag left button while zoomed

SHOW - Opens printable graphic in a new window

[6-H SLR FIELDS](#)

[6-H ACCUMULATION FIELDS](#)

[DIFFERENCE FIELDS](#)

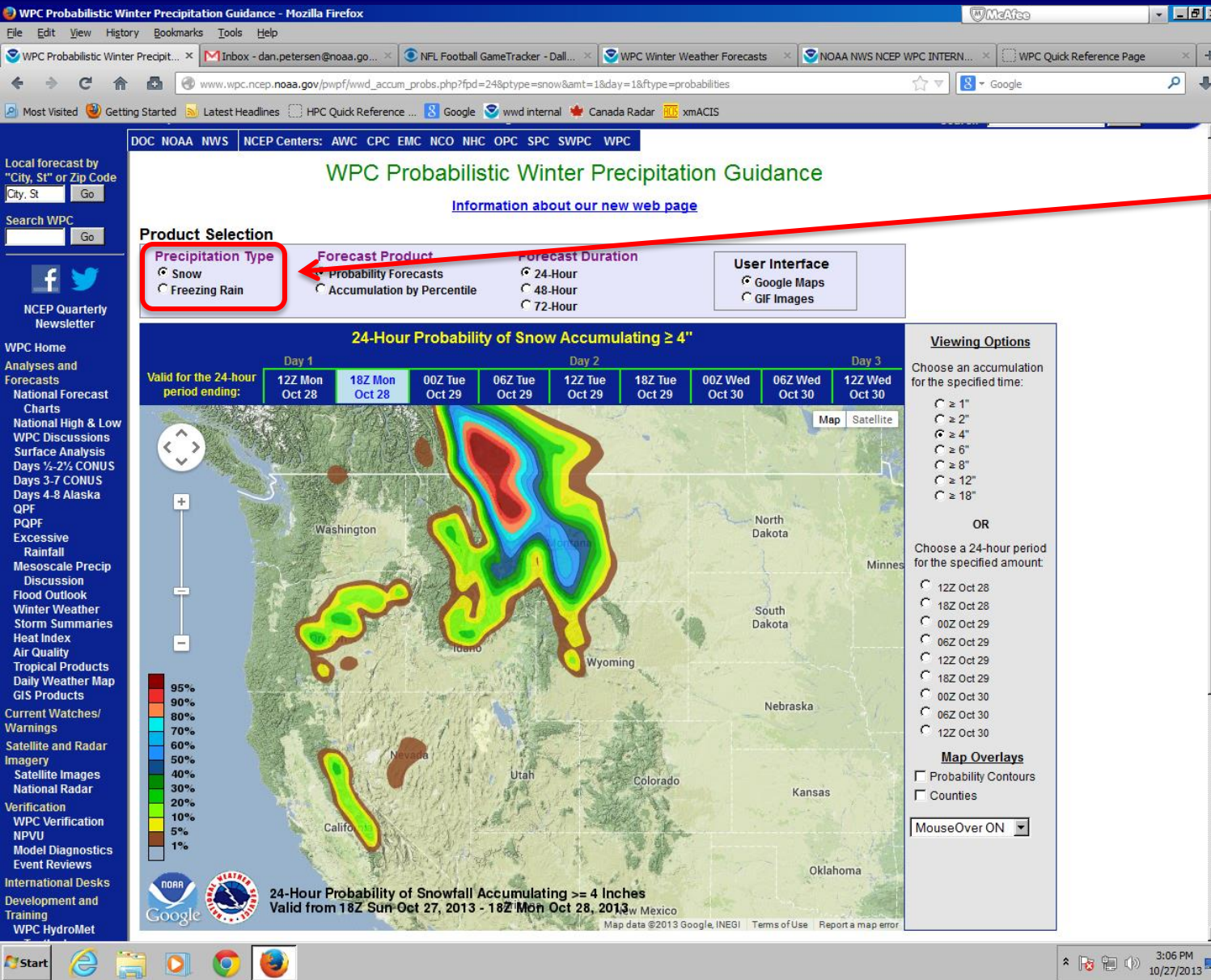
[DOWNLOAD PRODUCTS IN GIS FORMAT](#)

Start NOAA NWS NCEP W... WDTB_13_14-1d.ppt...

4:16 AM 10/31/2013

Forecasts at <http://www.wpc.ncep.noaa.gov/wwd/internal>

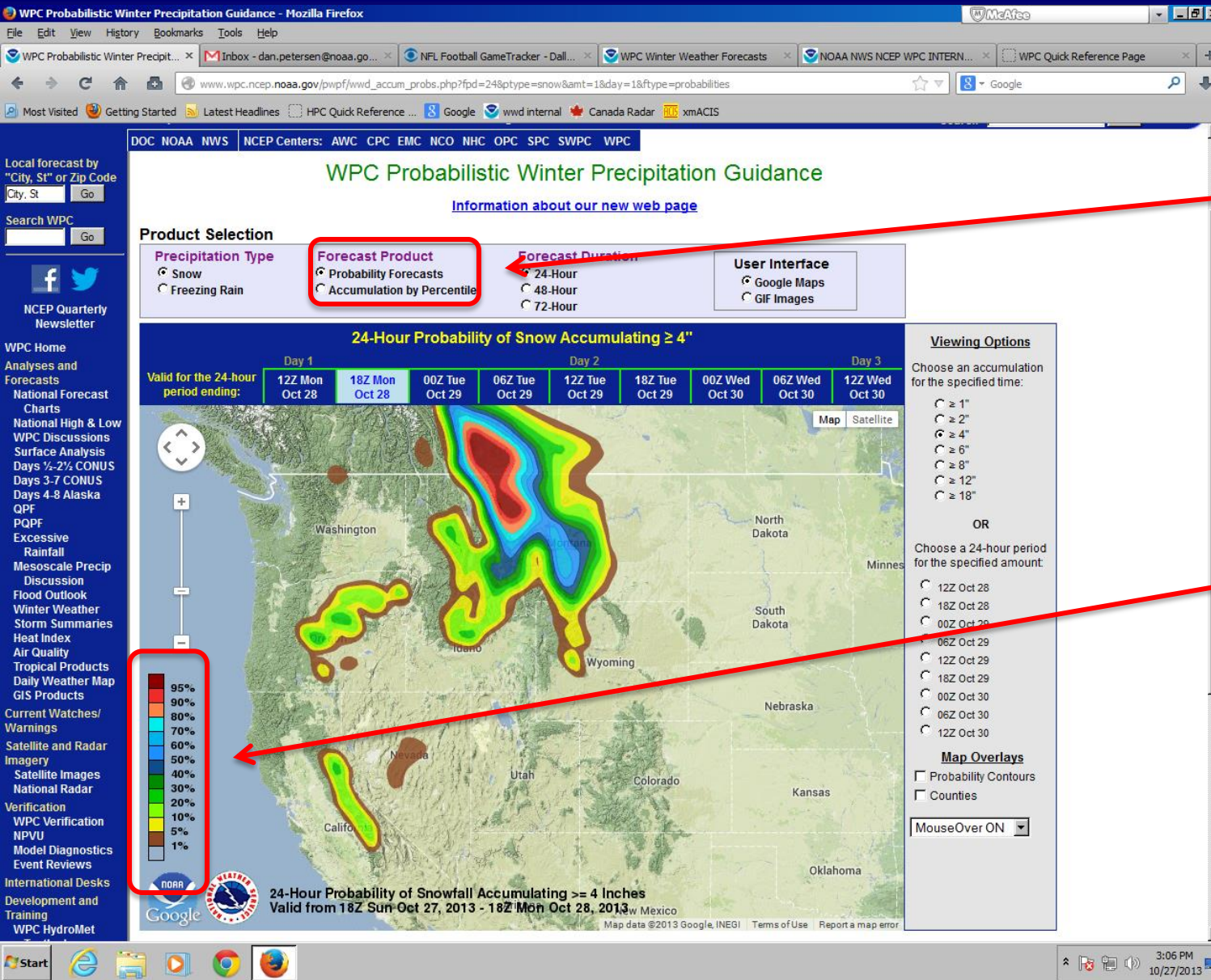
Current WPC Winter Weather Operations



Forecasts for both snow and freezing rain

Forecasts at http://www.wpc.ncep.noaa.gov/wwd/winter_wx.shtml

Current WPC Winter Weather Operations

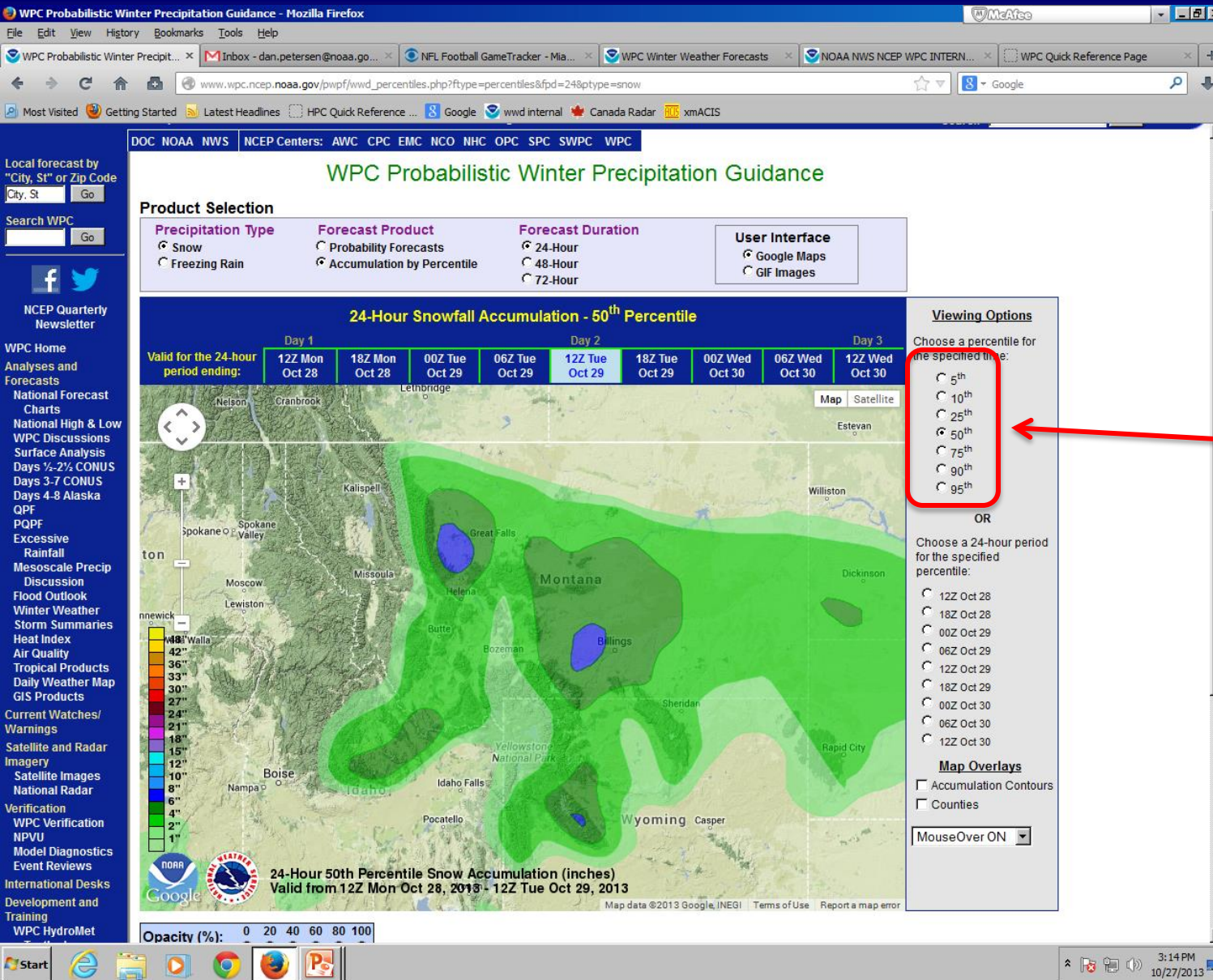


Forecasts for both probabilities and percentiles

Probabilities now cover 1-100 percent

Forecasts at http://www.wpc.ncep.noaa.gov/wwd/winter_wx.shtml

Current WPC Winter Weather Operations



In the percentiles, you can choose options for the 5th, 10th, 25th, 75th, 90th, 95th percentiles

http://www.wpc.ncep.noaa.gov/pwpf/about_pwpf_products.shtml

Current WPC Winter Weather Operations

WPC Probabilistic Winter Precipitation Guidance - Mozilla Firefox

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www.wpc.ncep.noaa.gov/pwfp/wwd_percentiles.php?ftype=percentiles&fpd=24&ptype=snow

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DOC NOAA NWS NCEP Centers: AWC CPC EMC NCO NHC OPC SPC SWPC WPC

WPC Probabilistic Winter Precipitation Guidance

Product Selection

Precipitation Type

- ☒ Snow
- ☐ Freezing Rain

Forecast Product

- ☐ Probability Forecasts
- ☒ Accumulation by Percentile

Forecast Duration

- ☒ 24-Hour
- ☐ 48-Hour
- ☐ 72-Hour

User Interface

- ☒ Google Maps
- ☐ GIF Images

24-Hour Snowfall Accumulation - 50th Percentile

Valid for the 24-hour period ending:

Day 1	Day 2	Day 3
12Z Mon Oct 28	12Z Tue Oct 29	12Z Wed Oct 30

Map Satellite

Viewing Options

Choose a percentile for the specified time:

- ☐ 5th
- ☐ 10th
- ☐ 25th
- ☒ 50th
- ☐ 75th
- ☐ 90th
- ☐ 95th

OR

Choose a 24-hour period for the specified percentile:

- ☐ 12Z Oct 28
- ☐ 18Z Oct 28
- ☐ 00Z Oct 29
- ☐ 06Z Oct 29
- ☐ 12Z Oct 29
- ☐ 18Z Oct 29
- ☐ 00Z Oct 30
- ☐ 06Z Oct 30
- ☐ 12Z Oct 30

Map Overlays

- ☒ Accumulation Contours
- ☒ Counties

MouseOver ON

24-Hour 50th Percentile Snow Accumulation (inches)
Valid from 12Z Mon Oct 28, 2013 - 12Z Tue Oct 29, 2013

Map data ©2013 Google, INEGI Terms of Use Report a map error

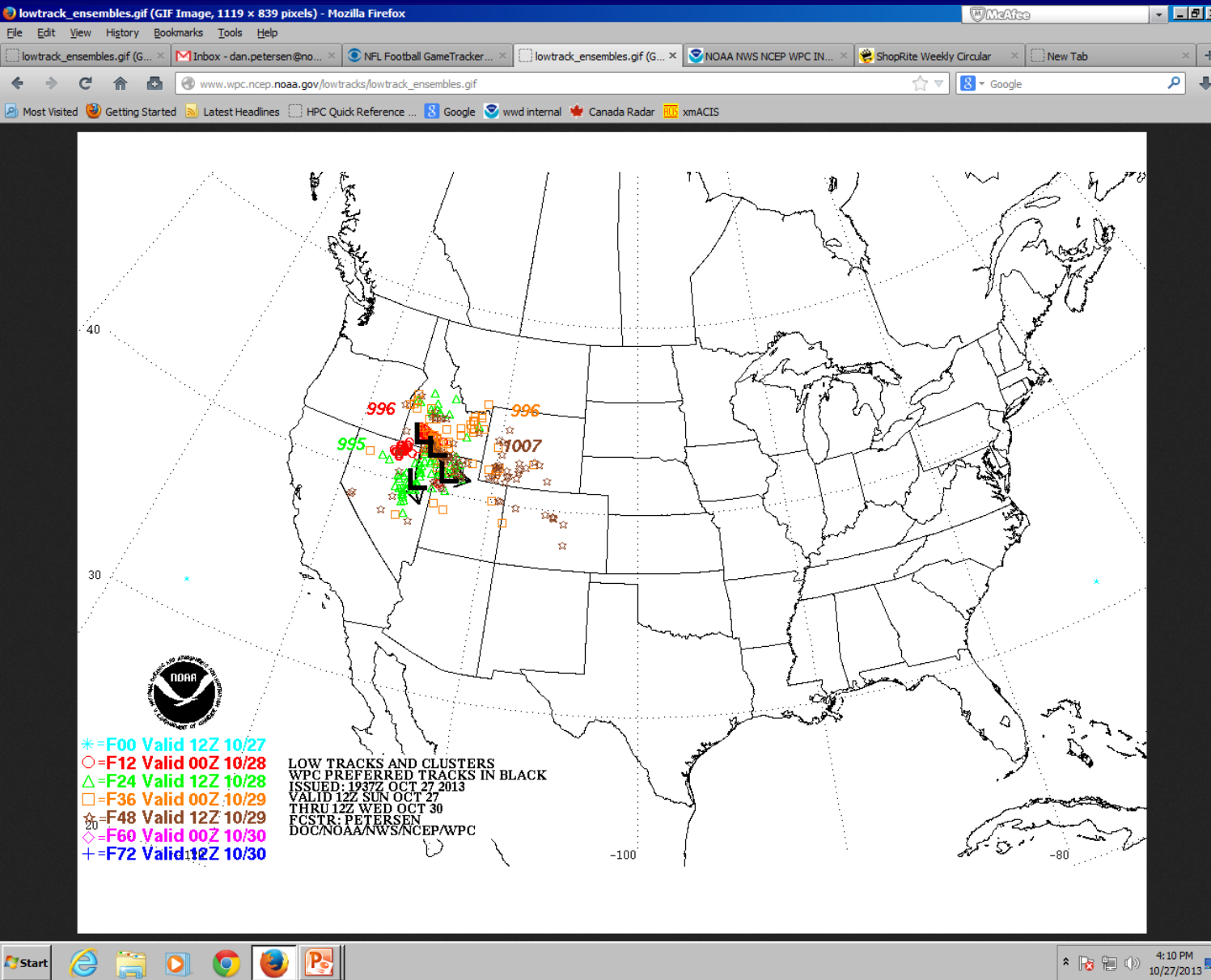
Opacity (%): 0 20 40 60 80 100

Start e f g h i j k l m n o p q r s t u v w x y z

3:17 PM 10/27/2013

In the map overlays, you can choose to display contours and/or counties

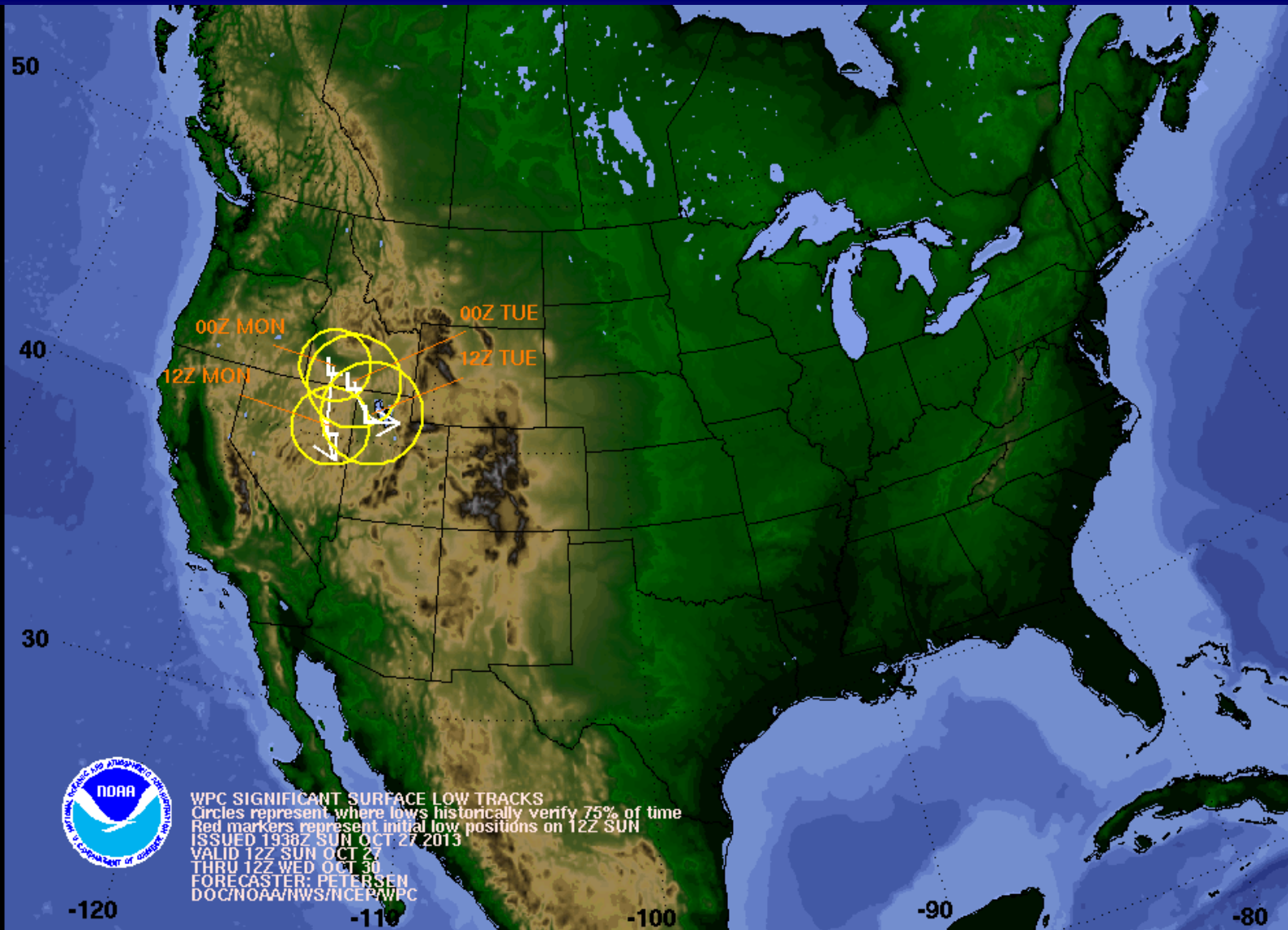
Current WPC Winter Weather Operations



Surface Low
tracks
forecast for
12-72 hours

http://www.wpc.ncep.noaa.gov/lowtracks/lowtrack_ensembles.gif

Current WPC Winter Weather Operations



Surface
Low tracks
forecast
for 12-72
hours with
average
error
circles

Winter weather desk schedule

- **01-10z and 13-22z are the shifts**
- **Deadlines for accumulations are 05/17z (day 1), 0545/1745z (day 2), and 0615/1815z (day 3)**
- **0615-0815z, 1815-2015z collaborate with WFOs, do low tracks/discussion**
- **0815z/2015z send snow/ice probabilities**
- **0830-1000z/2030-2200z edit and post test days 4-7 probabilities**

Changes in Operations for 2013-14

- Expanded Probabilistic Snow and Ice Forecasts provided on web site in 2012-13 now operational
- Probability forecasts now provided in Google Maps and cover 72 hour forecast
- 33-member ensemble including: WPC deterministic forecast, 21 SREF members, GFS, GEFS Mean, 5 GEFS members (new for 2013-14), ECMWF, ECMWF Ensemble Mean, Canadian Global, UKMET snowfall/freezing rain forecasts

Local forecast by
"City, St" or Zip Code
City, St Go

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Days 3-7 CONUS
Days 4-8 Alaska
QPF
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Discussion
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Winter Weather
Storm Summaries
Heat Index
Air Quality
Tropical Products
Daily Weather Map
GIS Products
Current Watches/
Warnings
Satellite and Radar
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Satellite Images
National Radar
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Event Reviews
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Training
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Testbed
Development
Experimental

WPC Probabilistic Winter Precipitation Guidance

[Information about our new web page](#)

Product Selection

Precipitation Type
☒ Snow
☐ Freezing Rain

Forecast Product
☒ Probability Forecasts
☐ Accumulation by Percentile

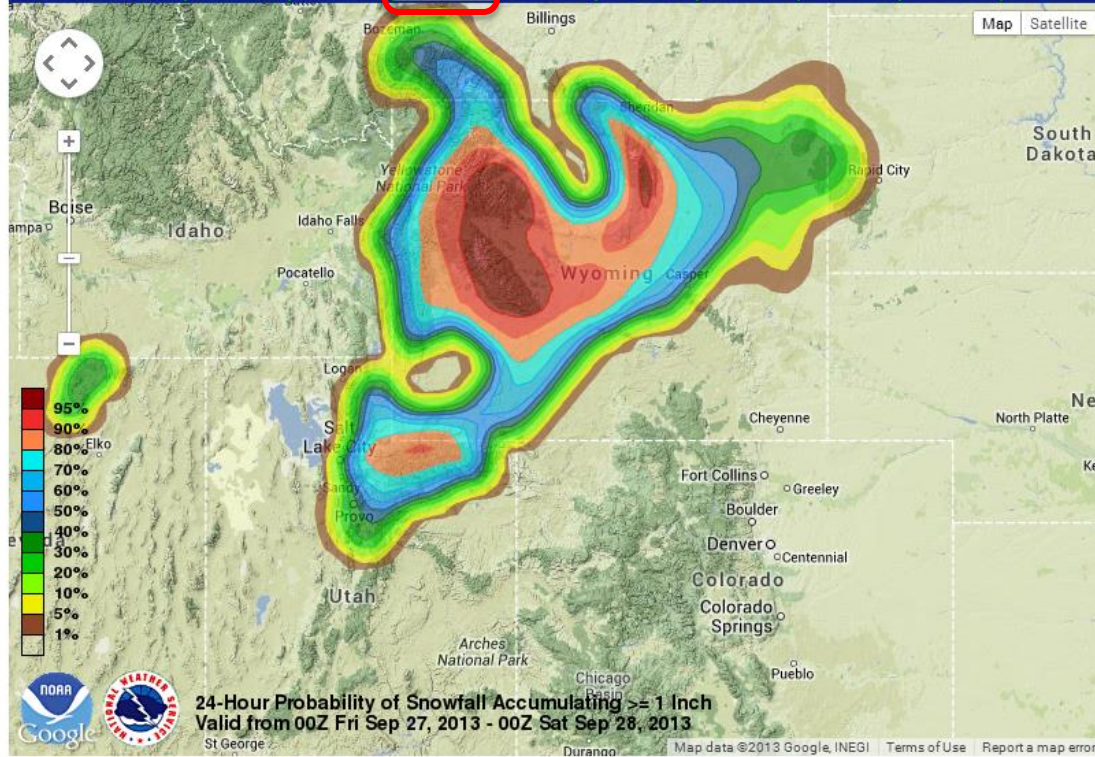
Forecast Duration
☒ 24-Hour
☐ 48-Hour
☐ 72-Hour

User Interface
☒ Google Maps
☐ GIF Images

Forecast in six
hour time steps

24-Hour Probability of Snow Accumulating $\geq 1"$

Valid for the 24-hour period ending:	Day 1 12Z Fri Sep 27	18Z Fri Sep 27	00Z Sat Sep 28	06Z Sat Sep 28	Day 2 12Z Sat Sep 28	18Z Sat Sep 28	00Z Sun Sep 29	06Z Sun Sep 29	Day 3 12Z Sun Sep 29
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Viewing Options

Choose an accumulation
for the specified time:

- ☒ $\geq 1"$
- ☐ $\geq 2"$
- ☐ $\geq 4"$
- ☐ $\geq 6"$
- ☐ $\geq 8"$
- ☐ $\geq 12"$
- ☐ $\geq 18"$

OR

Choose a 24-hour period
for the specified amount:

- ☐ 12Z Sep 27
- ☐ 18Z Sep 27
- ☐ 00Z Sep 28
- ☐ 06Z Sep 28
- ☐ 12Z Sep 28
- ☐ 18Z Sep 28
- ☐ 00Z Sep 29
- ☐ 06Z Sep 29
- ☐ 12Z Sep 29

Map Overlays

- ☐ Probability Contours
- ☐ Counties

MouseOver ON

Opacity (%): 0 20 40 60 80 100

Local forecast by "City, St" or Zip Code
City, St Go

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Storm Summaries
Heat Index
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Tropical Products
Daily Weather Map
GIS Products
Current Watches/Warnings
Satellite and Radar Imagery
Satellite Images
National Radar
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- ☒ Probability Forecasts
- ☐ Accumulation by Percentile

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- ☒ 24-Hour
- ☐ 48-Hour
- ☐ 72-Hour

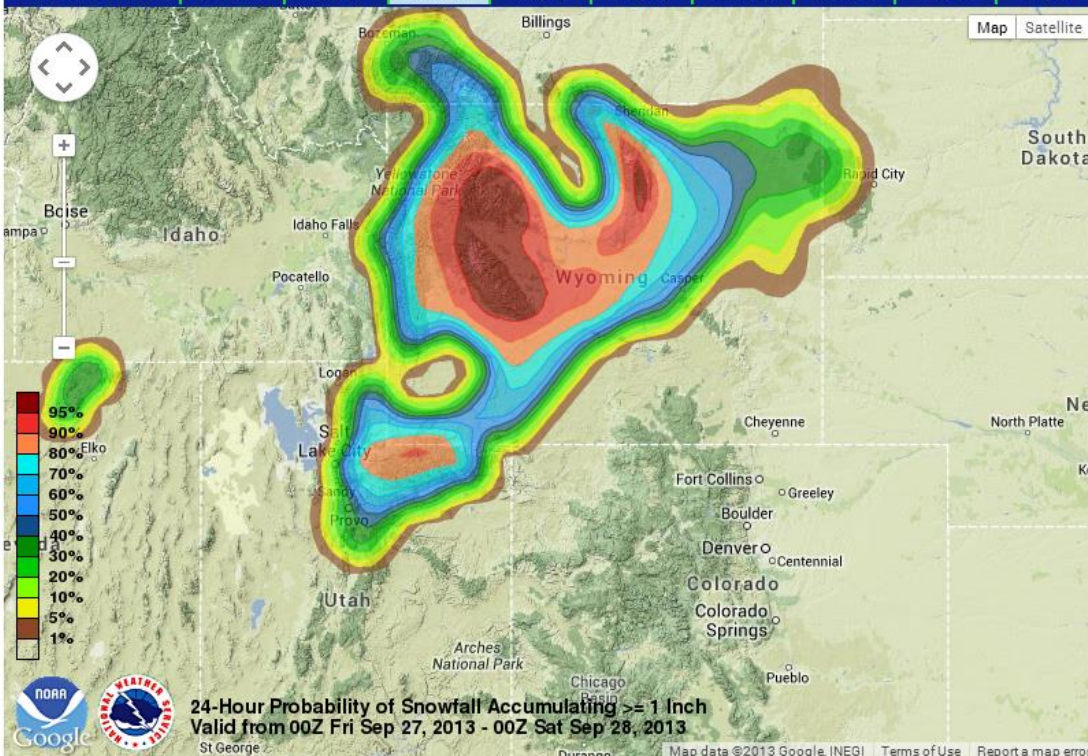
User Interface

- ☒ Google Maps
- ☐ GIF Images

Choose a forecast Duration

24-Hour Probability of Snow Accumulating $\geq 1"$

Valid for the 24-hour period ending:	Day 1		Day 2				Day 3	
	12Z Fri Sep 27	18Z Fri Sep 27	00Z Sat Sep 28	06Z Sat Sep 28	12Z Sat Sep 28	18Z Sat Sep 28	00Z Sun Sep 29	06Z Sun Sep 29



Viewing Options

Choose an accumulation for the specified time:

- ☒ $\geq 1"$
- ☐ $\geq 2"$
- ☐ $\geq 4"$
- ☐ $\geq 6"$
- ☐ $\geq 8"$
- ☐ $\geq 12"$
- ☐ $\geq 18"$

OR

Choose a 24-hour period for the specified amount:

- ☐ 12Z Sep 27
- ☐ 18Z Sep 27
- ☐ 00Z Sep 28
- ☐ 06Z Sep 28
- ☐ 12Z Sep 28
- ☐ 18Z Sep 28
- ☐ 00Z Sep 29
- ☐ 06Z Sep 29
- ☐ 12Z Sep 29

Map Overlays

- ☐ Probability Contours
- ☐ Counties

MouseOver ON

Opacity (%): 0 20 40 60 80 100

WPC Probabilistic x NOAA NWS NCEP x New Tab x New Tab x Tropical Storm Kai x GOP legislator: Bo x New Tab x NOAA NWS NCEP x

www.wpc.ncep.noaa.gov/pwfp/wwd_accum_probs.php?fpd=24&ptype=snow&amt=1&day=1&type=probabilities

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Days 4-8 Alaska

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Model Diagnostics

Event Reviews

International Desks

Development and Training

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Testbed

Development

Experimental Products

WPC Overview

About the WPC

Mission and Vision

Product Selection

Precipitation Type

☒ Snow

☐ Freezing Rain

Forecast Product

☒ Probability Forecasts

☐ Accumulation by Percentile

Forecast Duration

☒ 24-Hour

☐ 48-Hour

☐ 72-Hour

User Interface

☒ Google Maps

☐ GIF Images

Choose a user interface

24-Hour Probability of Snow Accumulating $\geq 12"$

Valid for the 24-hour period ending:

Day 1

00Z Sat Oct 05

06Z Sat Oct 05

12Z Sat Oct 05

18Z Sat Oct 05

Day 2

00Z Sun Oct 06

06Z Sun Oct 06

12Z Sun Oct 06

18Z Sun Oct 06

Day 3

00Z Mon Oct 07

Map Satellite

Idaho Falls

95%

90%

80%

70%

60%

50%

40%

30%

20%

10%

5%

1%

24-Hour Probability of Snowfall Accumulating ≥ 12 Inches

Valid from 00Z Fri Oct 04, 2013 - 00Z Sat Oct 05, 2013

Map data ©2013 Google, INEGI Terms of Use Report a map error

Viewing Options

Choose an accumulation for the specified time:

☐ $\geq 1"$

☐ $\geq 2"$

☐ $\geq 4"$

☐ $\geq 6"$

☐ $\geq 8"$

☒ $\geq 12"$

☐ $\geq 18"$

OR

Choose a 24-hour period for the specified amount:

☐ 00Z Oct 05

☐ 06Z Oct 05

☐ 12Z Oct 05

☐ 18Z Oct 05

☐ 00Z Oct 06

☐ 06Z Oct 06

☐ 12Z Oct 06

☐ 18Z Oct 06

☐ 00Z Oct 07

Map Overlays

☐ Probability Contours

☐ Counties

MouseOver ON

Opacity (%):

0 20 40 60 80 100

Information about these products

Download GRIB 2 24-Hour Snowfall Probability Guidance

Start

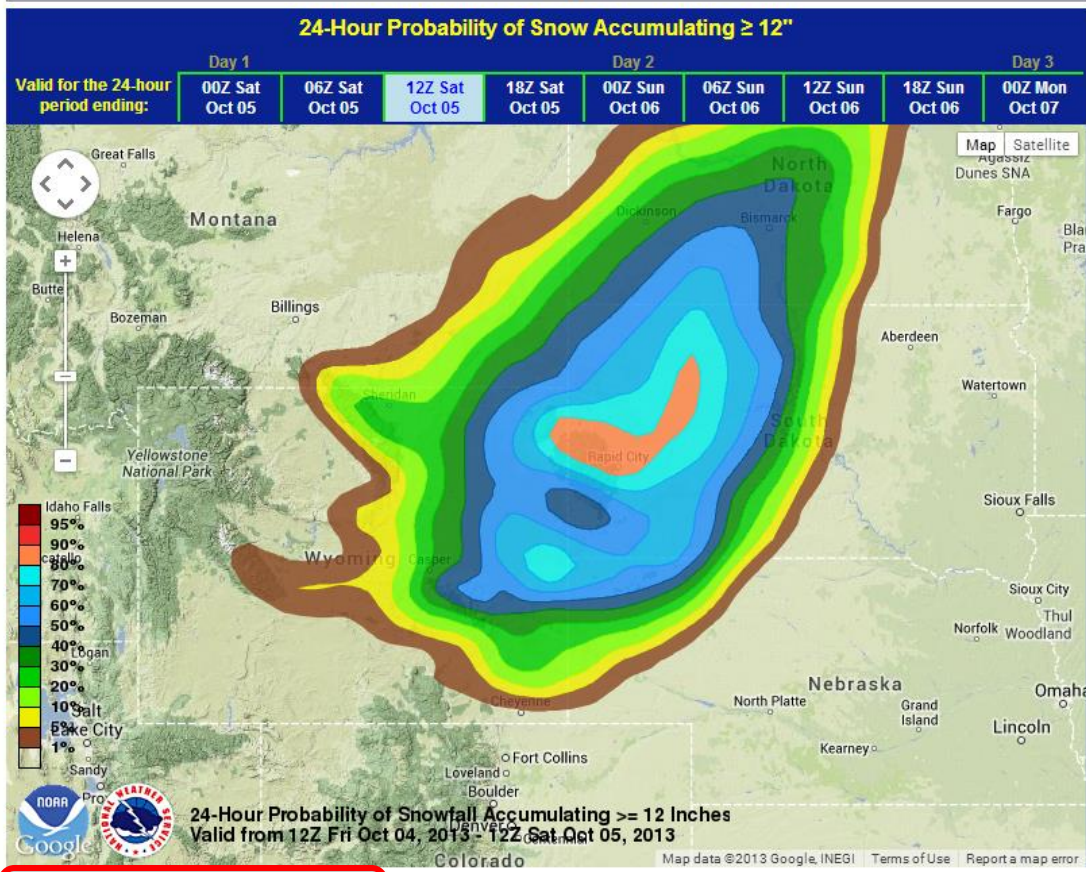
3:50 AM

10/4/2013

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Product Selection

Precipitation Type <input checked="" type="radio"/> Snow <input type="radio"/> Freezing Rain	Forecast Product <input checked="" type="radio"/> Probability Forecasts <input type="radio"/> Accumulation by Percentile	Forecast Duration <input checked="" type="radio"/> 24-Hour <input type="radio"/> 48-Hour <input type="radio"/> 72-Hour	User Interface <input checked="" type="radio"/> Google Maps <input type="radio"/> GIF Images
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Viewing Options

Choose an accumulation for the specified time:

- ☐ $\geq 1"$
- ☐ $\geq 2"$
- ☐ $\geq 4"$
- ☐ $\geq 6"$
- ☐ $\geq 8"$
- ☒ $\geq 12"$
- ☐ $\geq 18"$

OR

Choose a 24-hour period for the specified amount:

- ☐ 00Z Oct 05
- ☐ 06Z Oct 05
- ☐ 12Z Oct 05
- ☐ 18Z Oct 05
- ☐ 00Z Oct 06
- ☐ 06Z Oct 06
- ☐ 12Z Oct 06
- ☐ 18Z Oct 06
- ☐ 00Z Oct 07

Map Overlays

- ☐ Probability Contours
- ☐ Counties

MouseOver ON

Opacity (%): ☐ 0 ☐ 20 ☐ 40 ☐ 60 ☒ 80 ☐ 100

Choose opacity

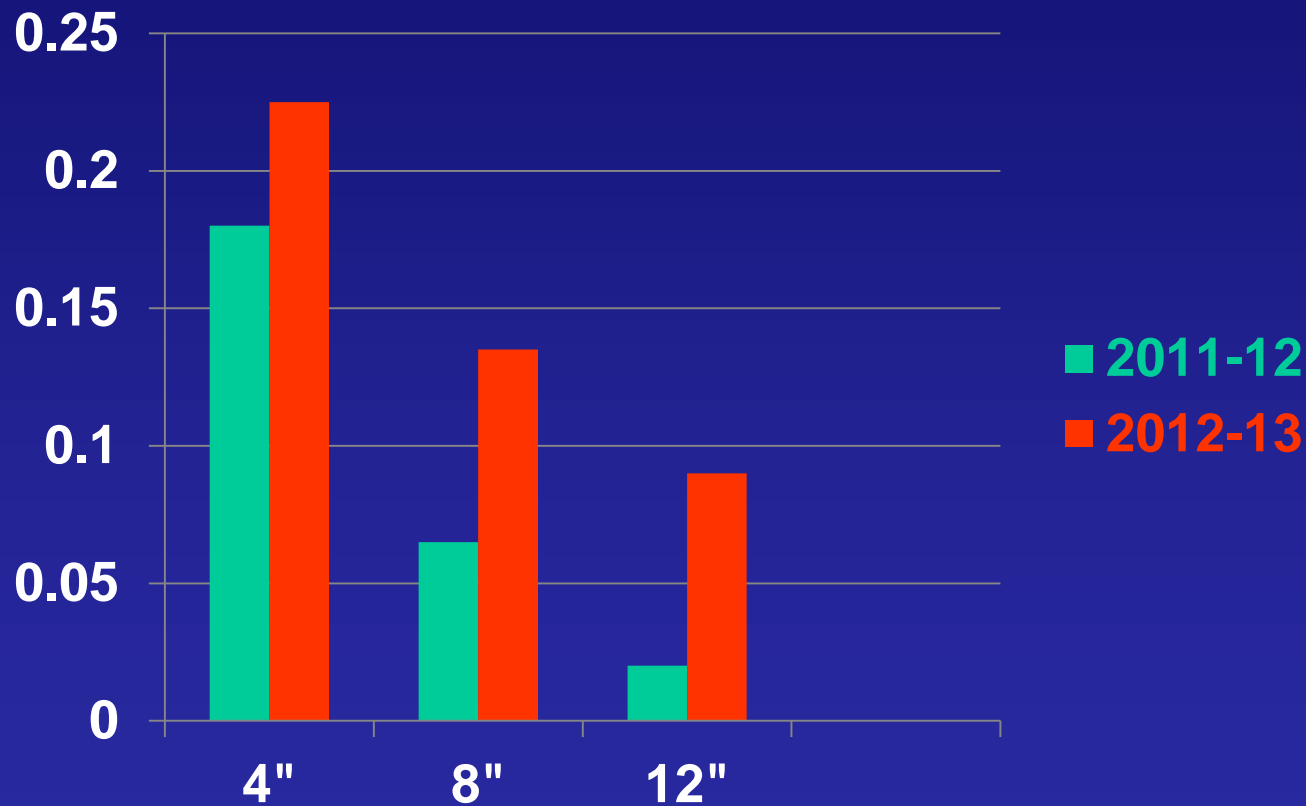
Information about these products

Download GRIB 2 24-Hour Snowfall Probability Guidance

2012-2013 WPC Winter Weather Desk Forecast Verification

WPC Deterministic Snowfall Forecast

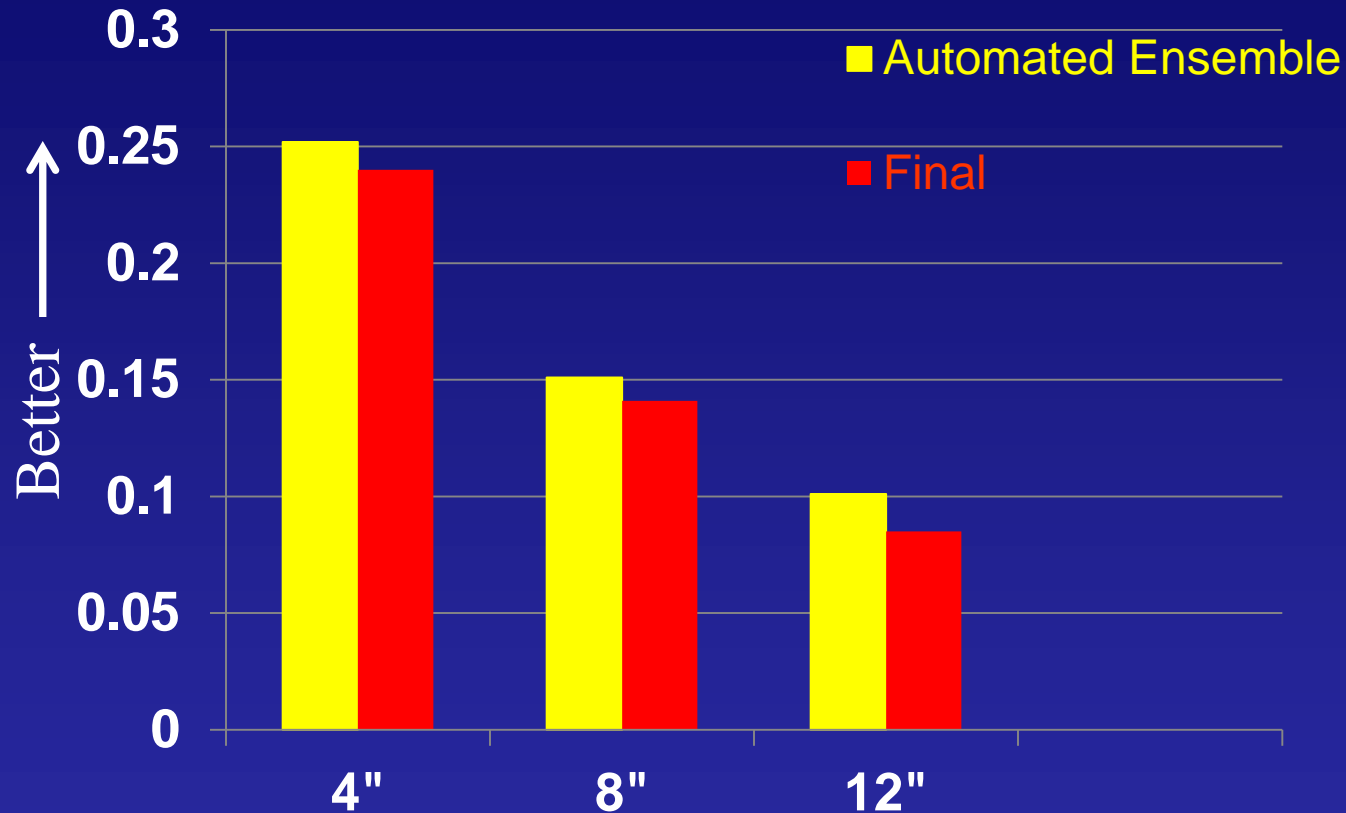
Day Two Snow Threat Score over the CONUS 2011-12 season vs 2012-13



WWD forecasts had higher threat scores for all three thresholds vs the winter of 2011-12

WPC Deterministic Snowfall Forecast

2012-13 Day One Snow Threat Score Over the CONUS

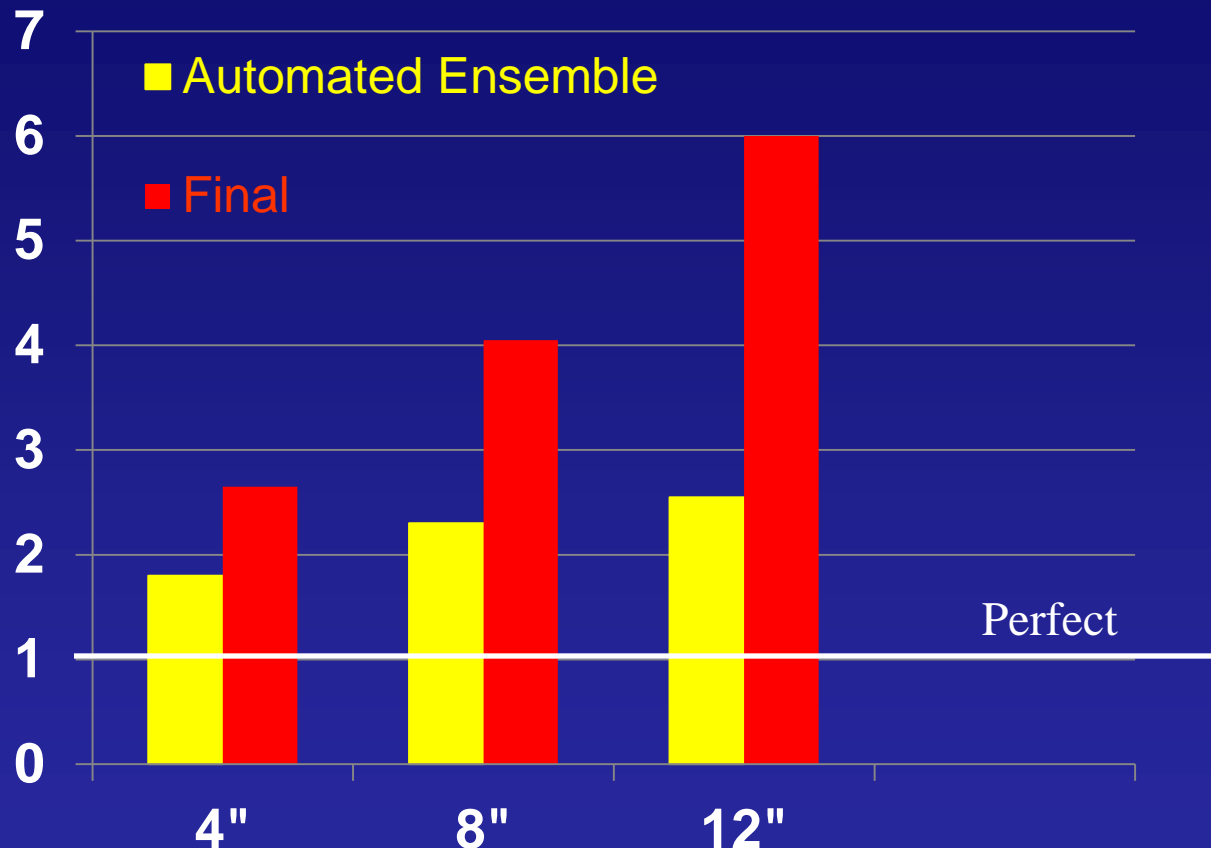


Final forecasts verify close to the Automated Ensemble for 4 and 8" but lost to automated ensemble for 12".

Automated Ensemble: NAM + GFS + ECMWF + SREF members + GEFS members

WPC Deterministic Snowfall Forecast

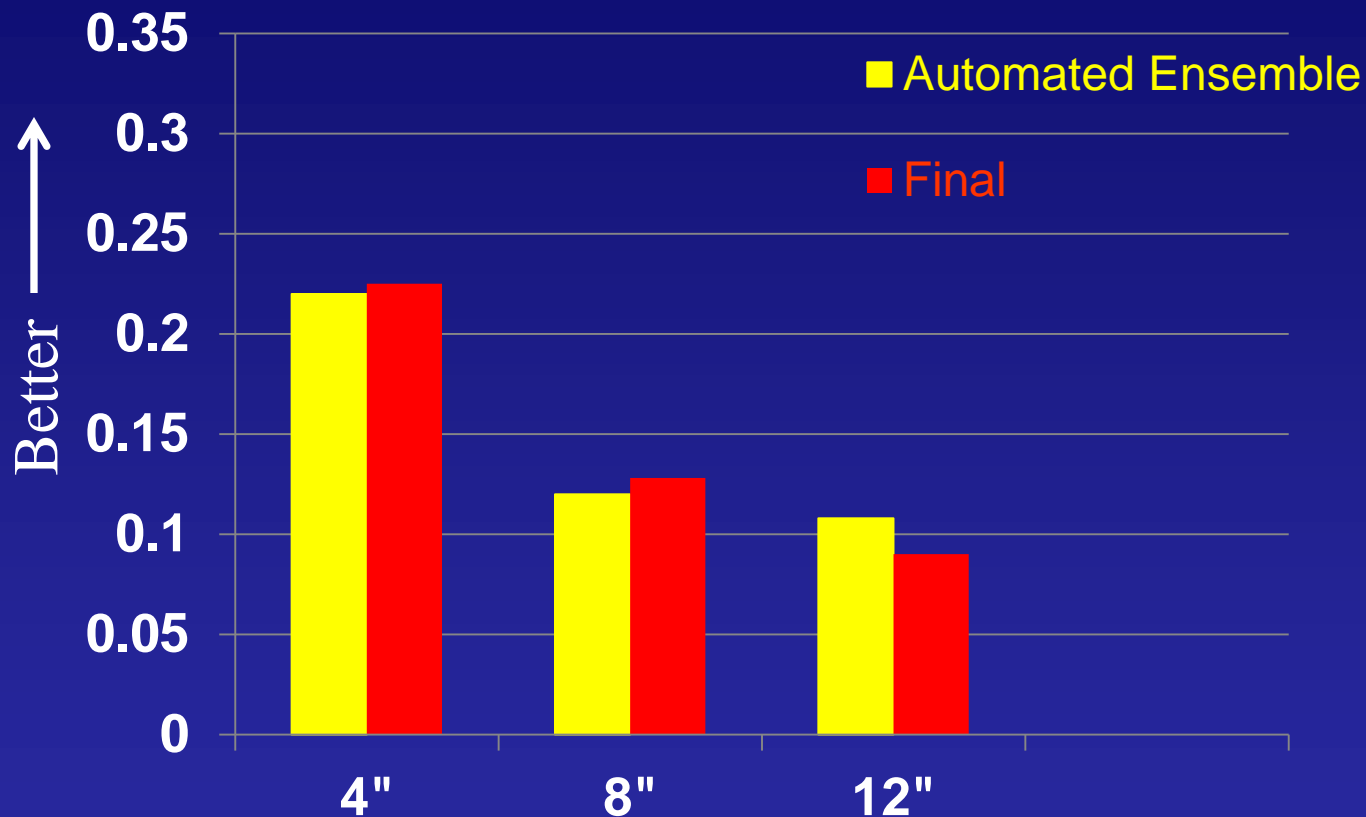
2012-13 Day **One** Snow Frequency Bias Over the CONUS



Final forecasts have a high bias, especially for 12"

WPC Deterministic Snowfall Forecast

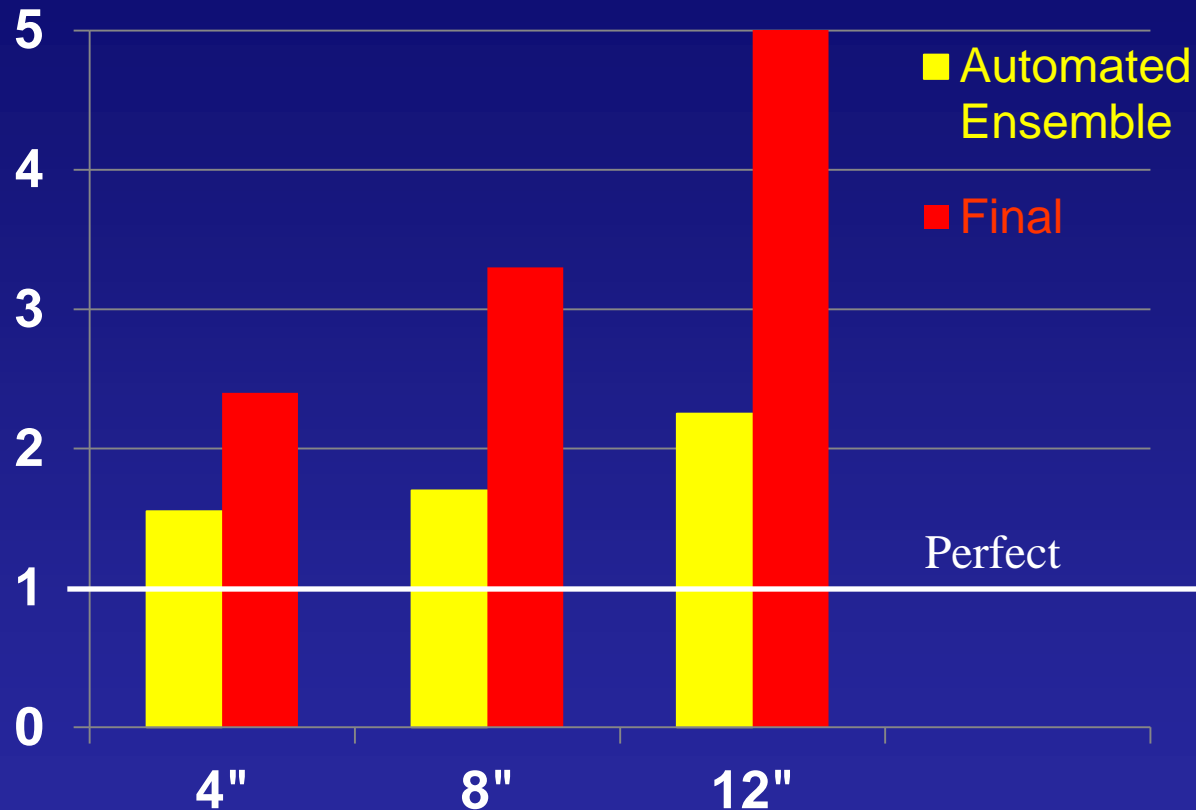
Day **Two** Snow **Threat** Score Over the CONUS



Final forecasts outperform the Automated Ensemble for 4 and 8 inches, but not for 12"

WPC Deterministic Snowfall Forecast

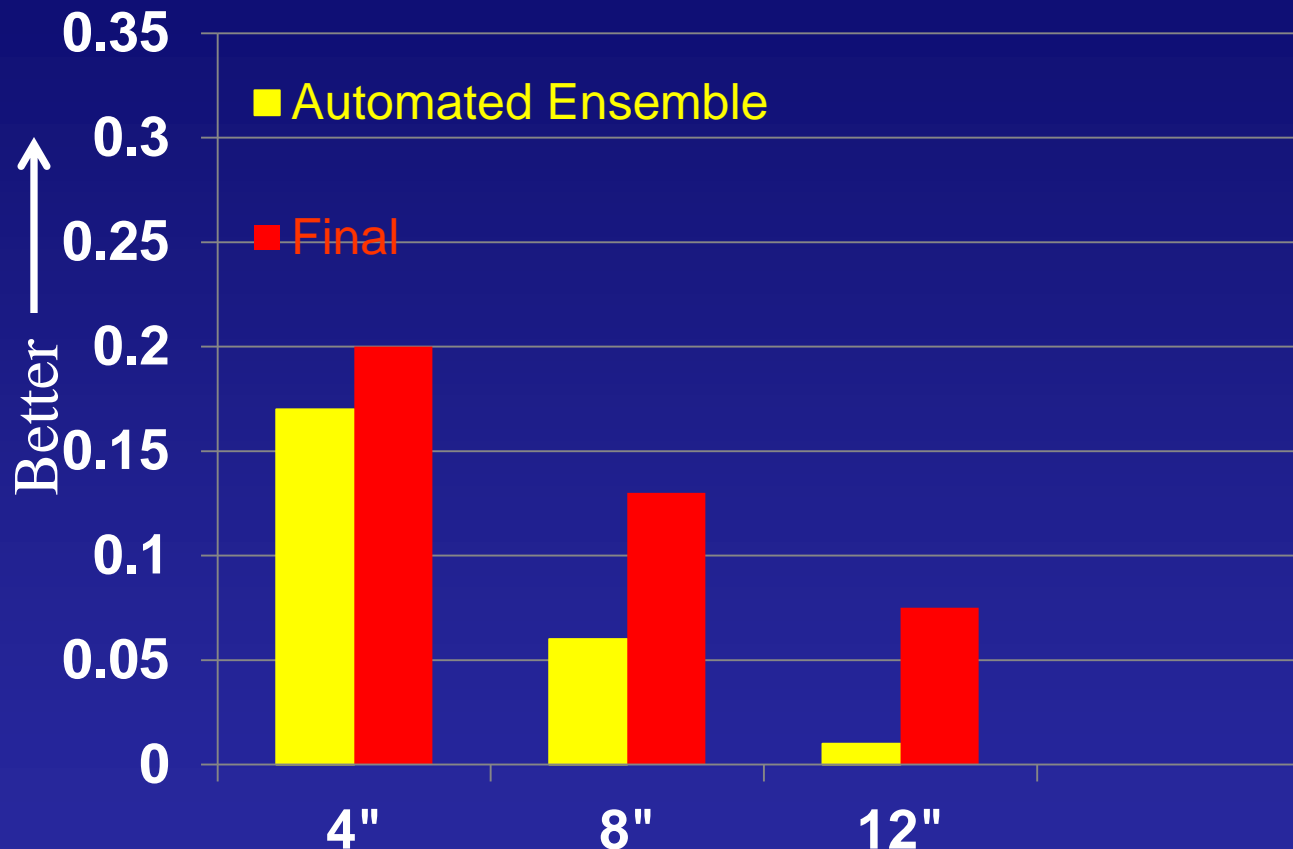
Day **Two** Snow Frequency Bias Over the CONUS



Final forecasts have a high bias, especially for 12"

WPC Deterministic Snowfall Forecast

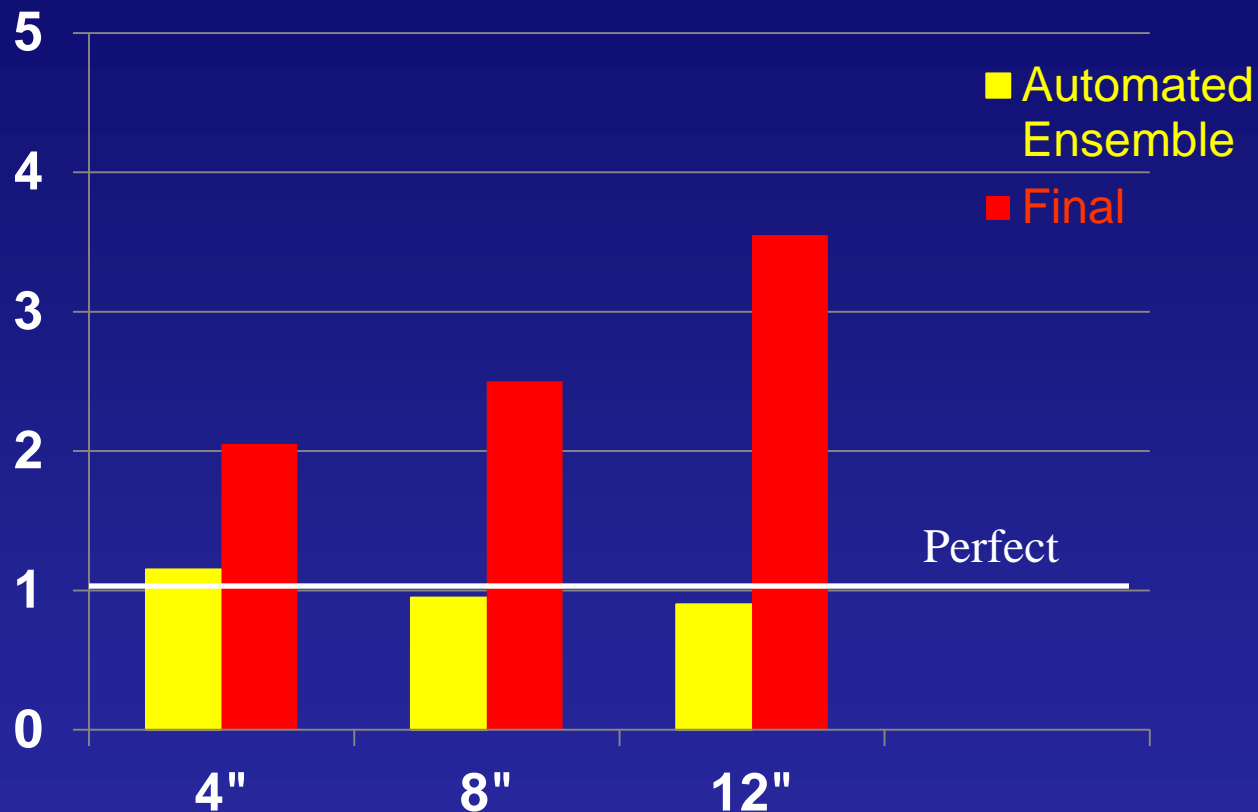
Day **Three** Snow **Threat** Score Over the CONUS



Final forecasts outperform the Automated Ensemble, particularly for 12"

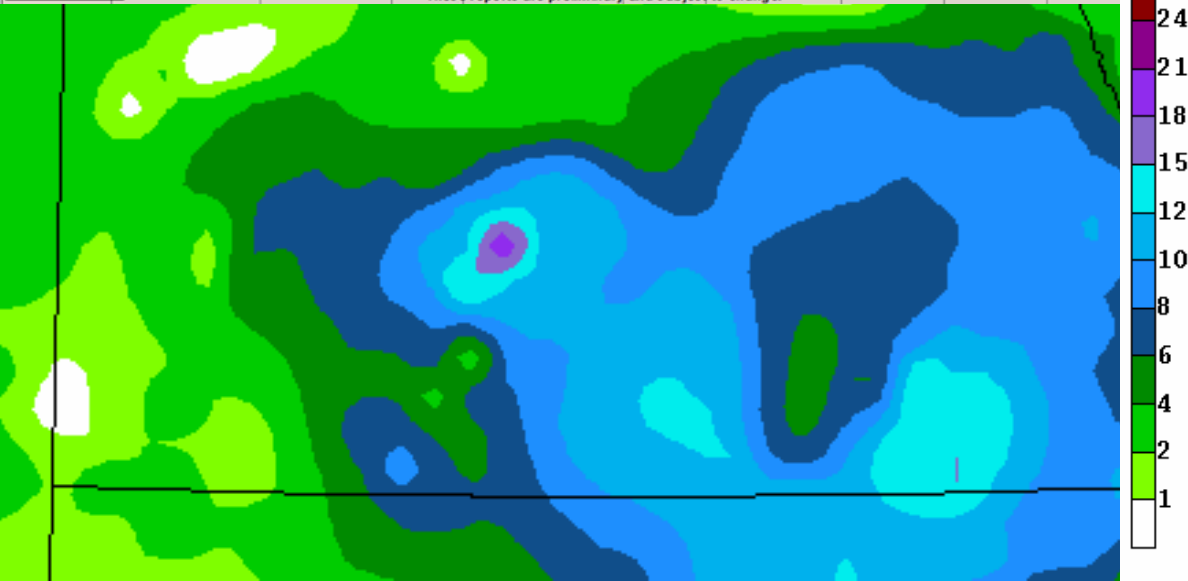
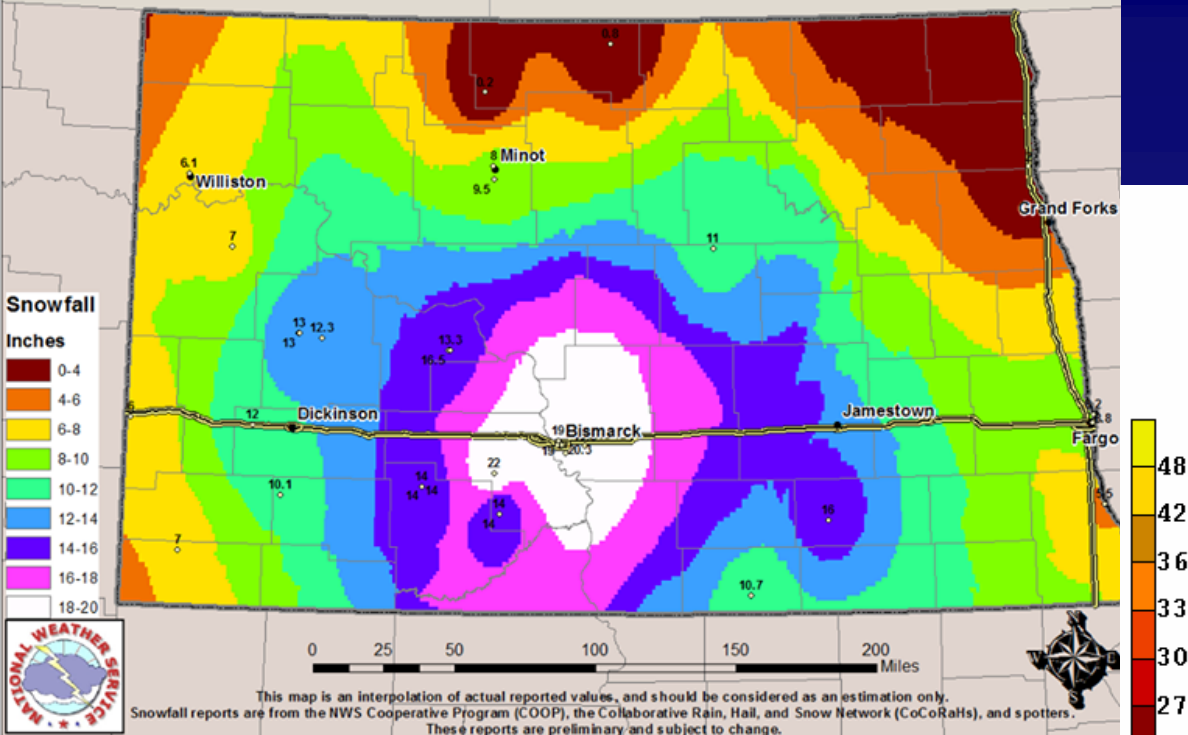
WPC Deterministic Snowfall Forecast

Day **Three** Snow Frequency Bias Over the CONUS



- Final forecasts have a high bias, especially for 12"
- Bias may be associated with snow analysis problems

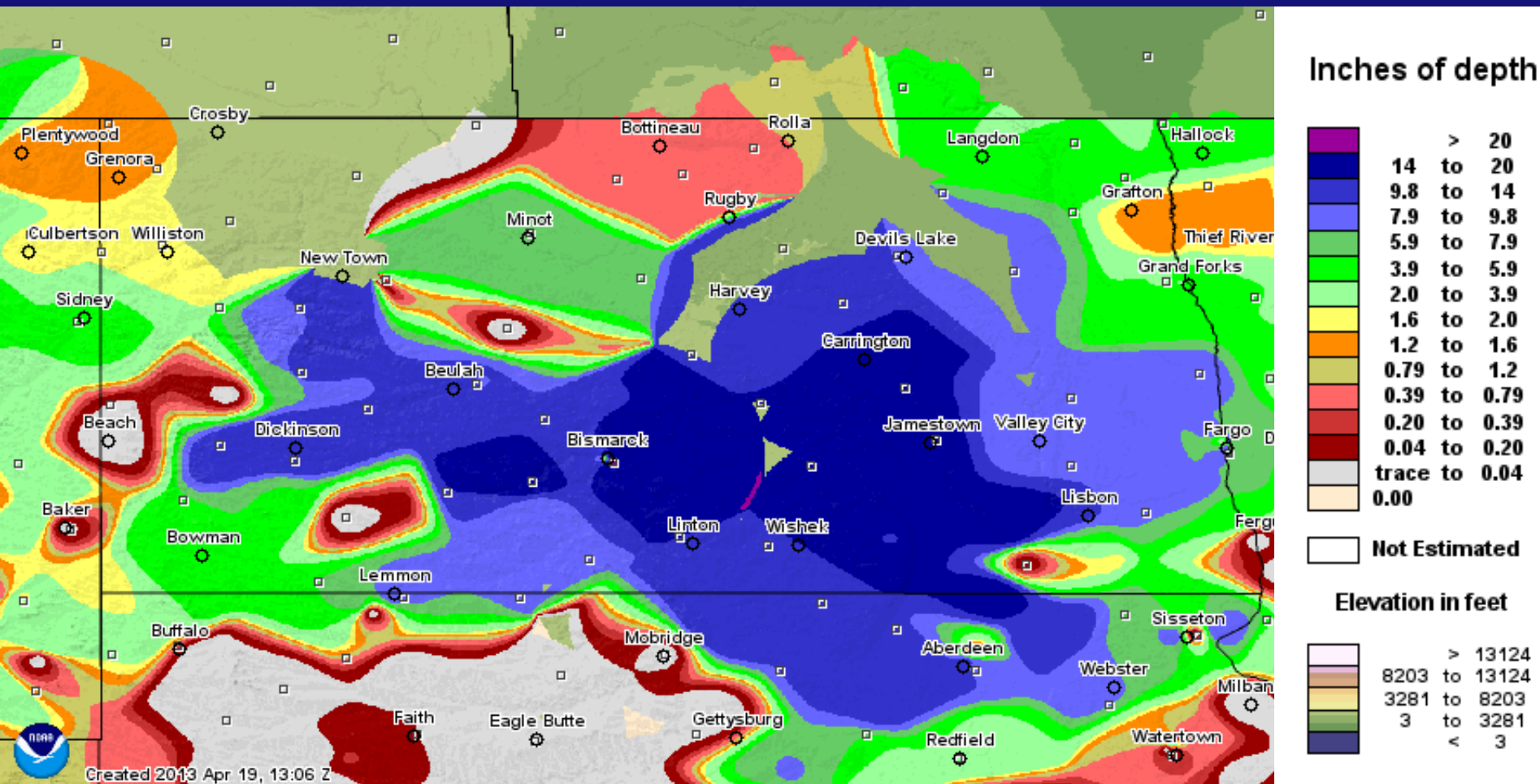
Storm Total Snowfall as of 11:00 AM Monday April 15th



- WFO BIS analysis (top) of snow ending 11 am CST 04/15/13
- WPC snow analysis 48 hour total verifying 12z 04/16/13
- Coverage of 12-18 inches much larger in BIS analysis (18" contour white in BIS/2nd purple in WPC)
- Bottom line: large uncertainty in snow analyses!

NOHRSC 48 hr snow analysis ending 12z April 16 2013

- <http://www.nohrsc.noaa.gov/interactive/html/map.html>



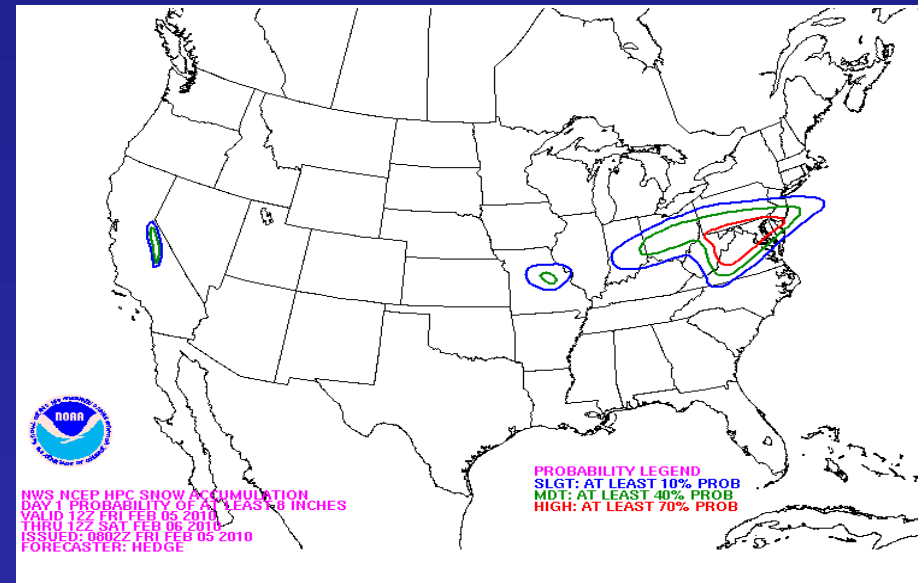
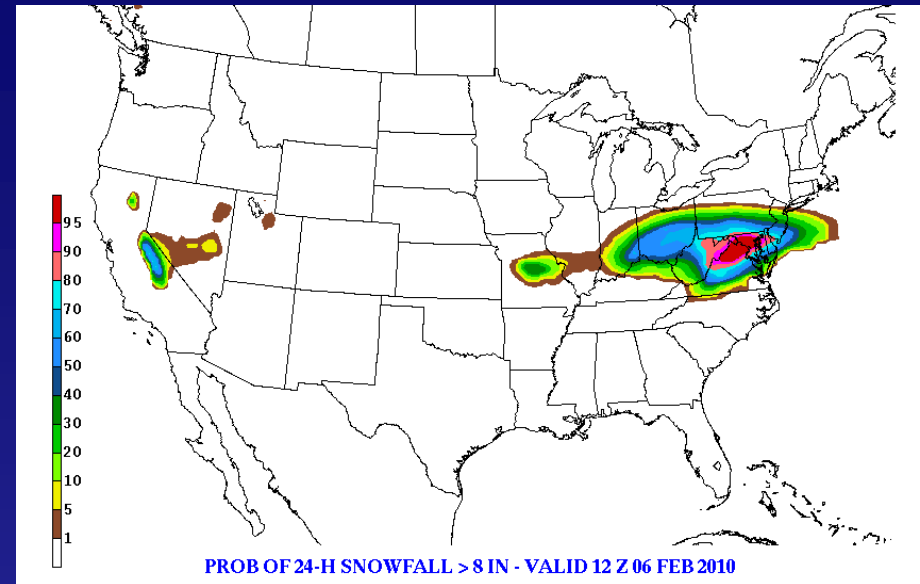
Probabilistic Snowfall Forecast

“Probabilistic Winter Precipitation Forecasts” (PWPF)

- Objectively combine WPC deterministic forecast with model/ensemble forecasts to derive forecasts for probabilistic snowfall

“Final”

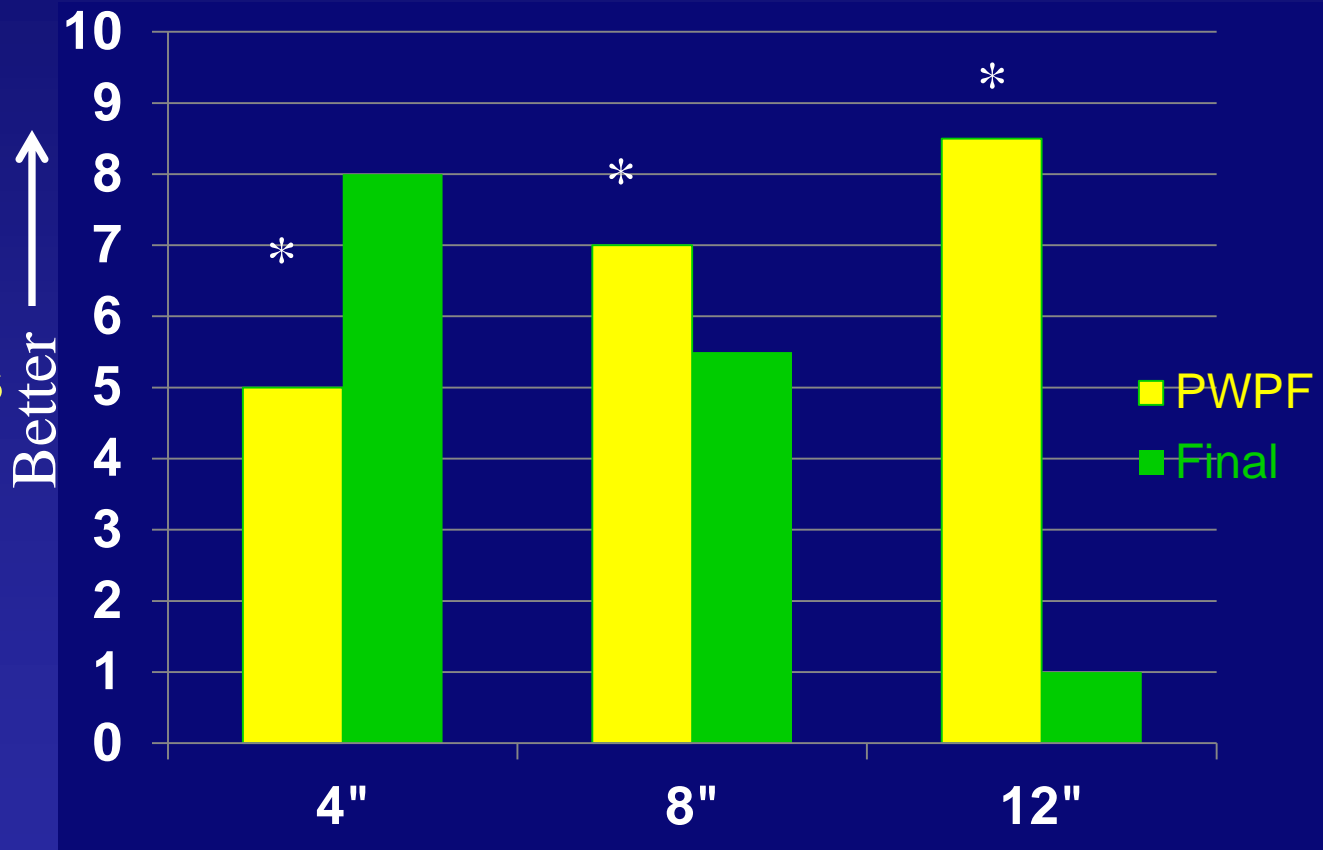
- Minimal PWPF edits by forecaster



Probabilistic Snowfall Forecast(PWPF)

Day **One** Snow Brier Skill Score vs. Automated Ensemble Over the CONUS

- Objective PWPF provided greater skill for 8" and 12" forecasts than the human-edited "final" forecast.

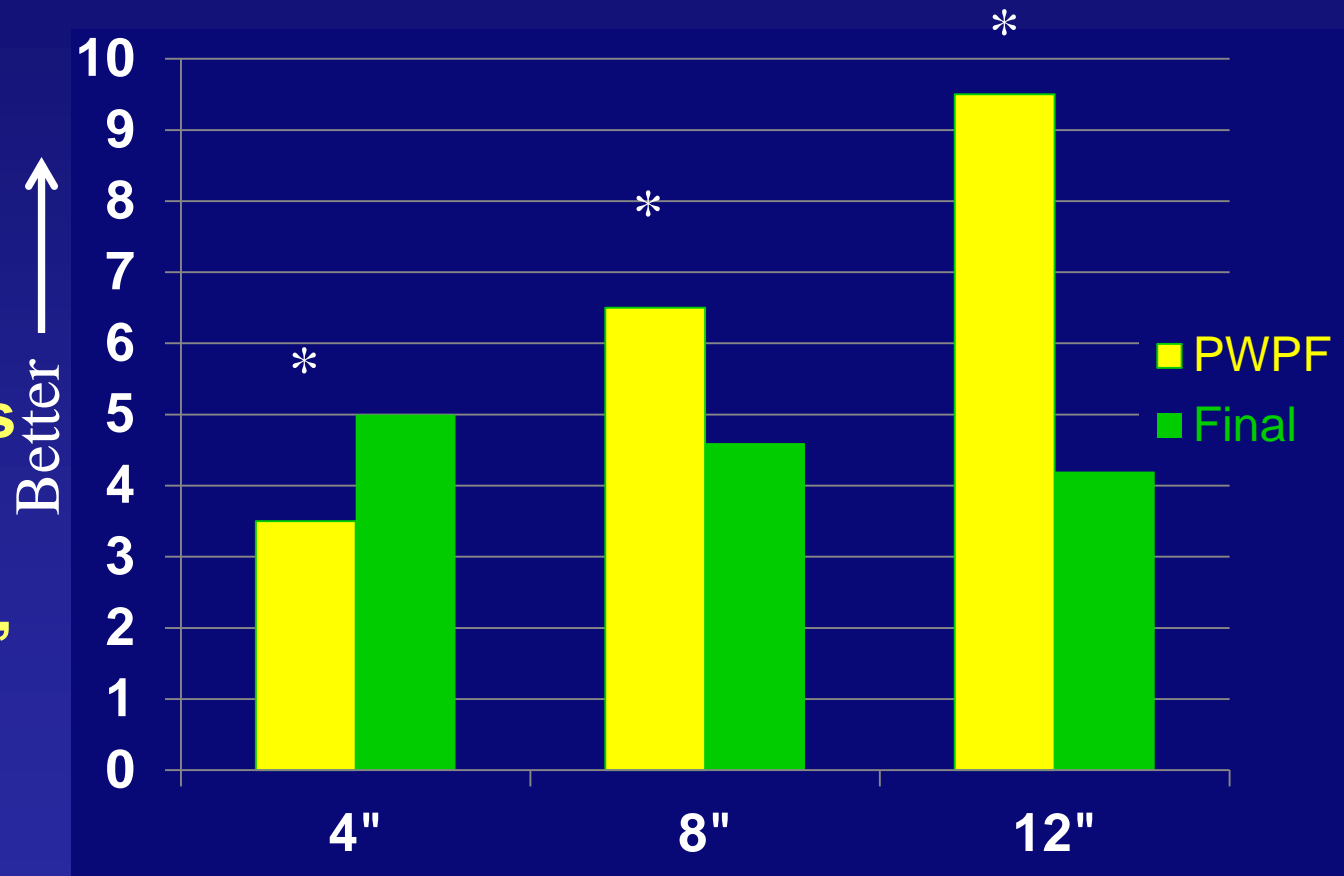


* Statistically significant improvement at the 95% confidence level

Probabilistic Snowfall Forecast(PWPF)

Day **Two** Snow Brier Skill Score vs. Auto Ensemble Over the CONUS

- Objective PWPF provided greater skill for 8" and 12" forecasts than the human-edited "final" forecast

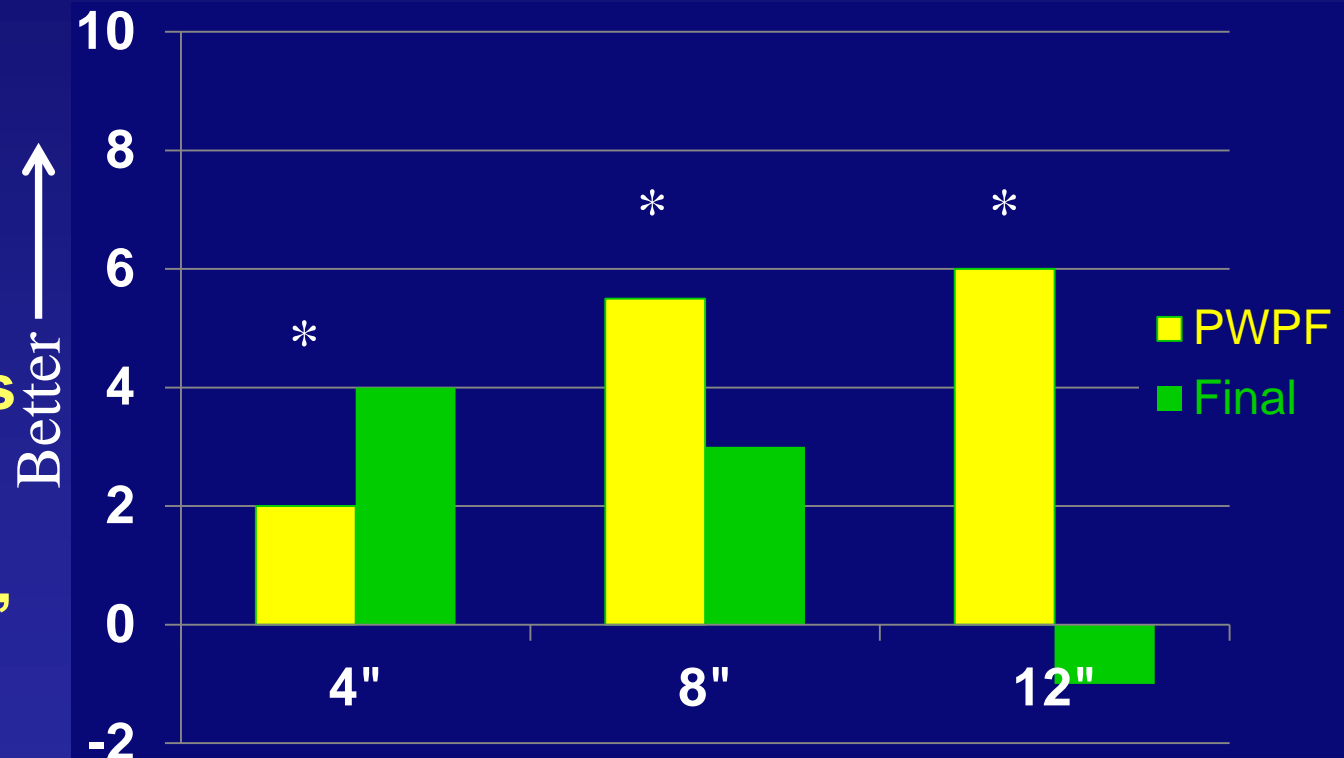


* Statistically significant improvement at the 95% confidence level

Probabilistic Snowfall Forecast(PWPF)

Day **Three** Snow Brier Skill Score vs. Auto Ensemble Over the CONUS

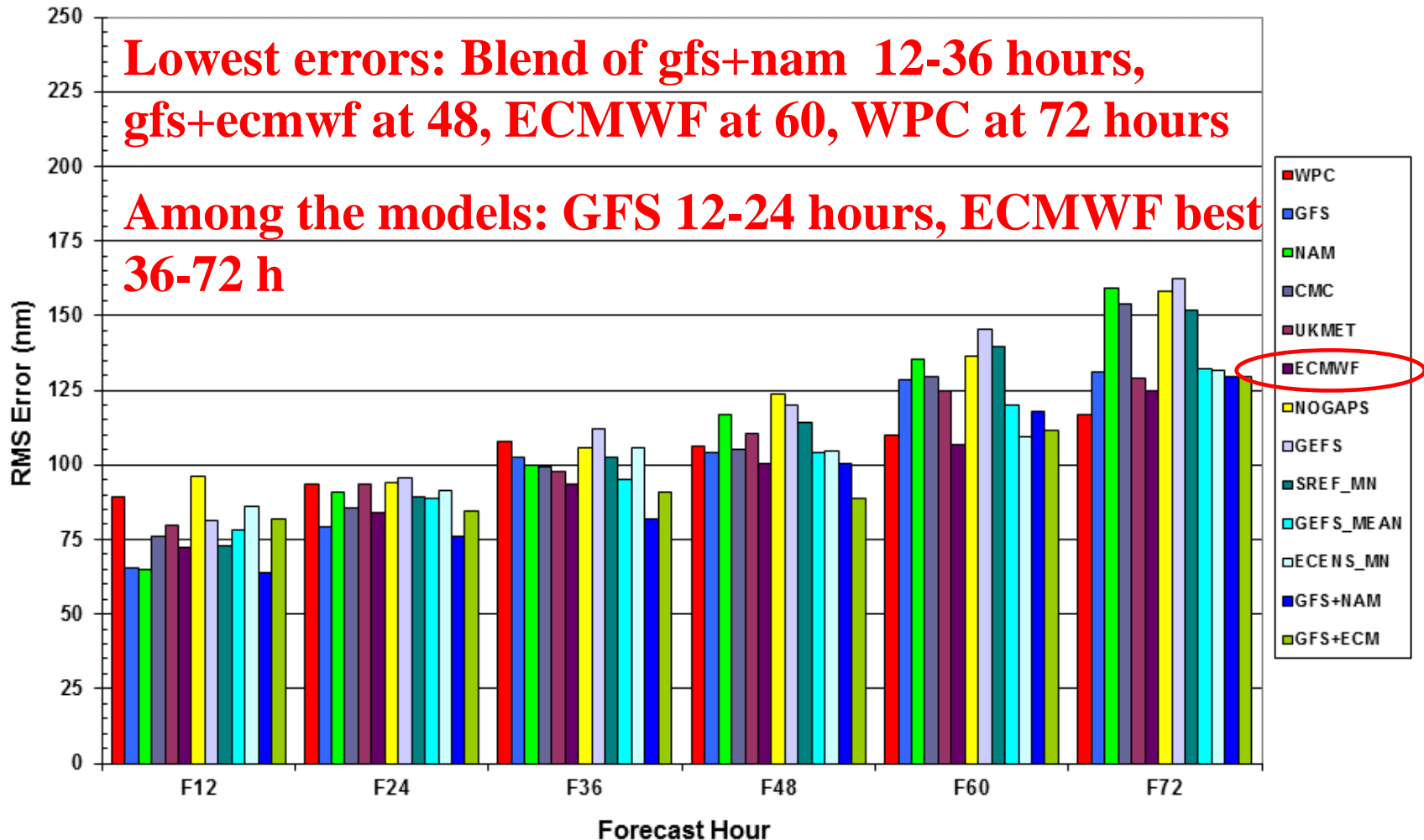
- Objective PWPF provided greater skill for 8" and 12" forecasts than the human-edited "final" forecast



* Statistically significant improvement at the 95% confidence level

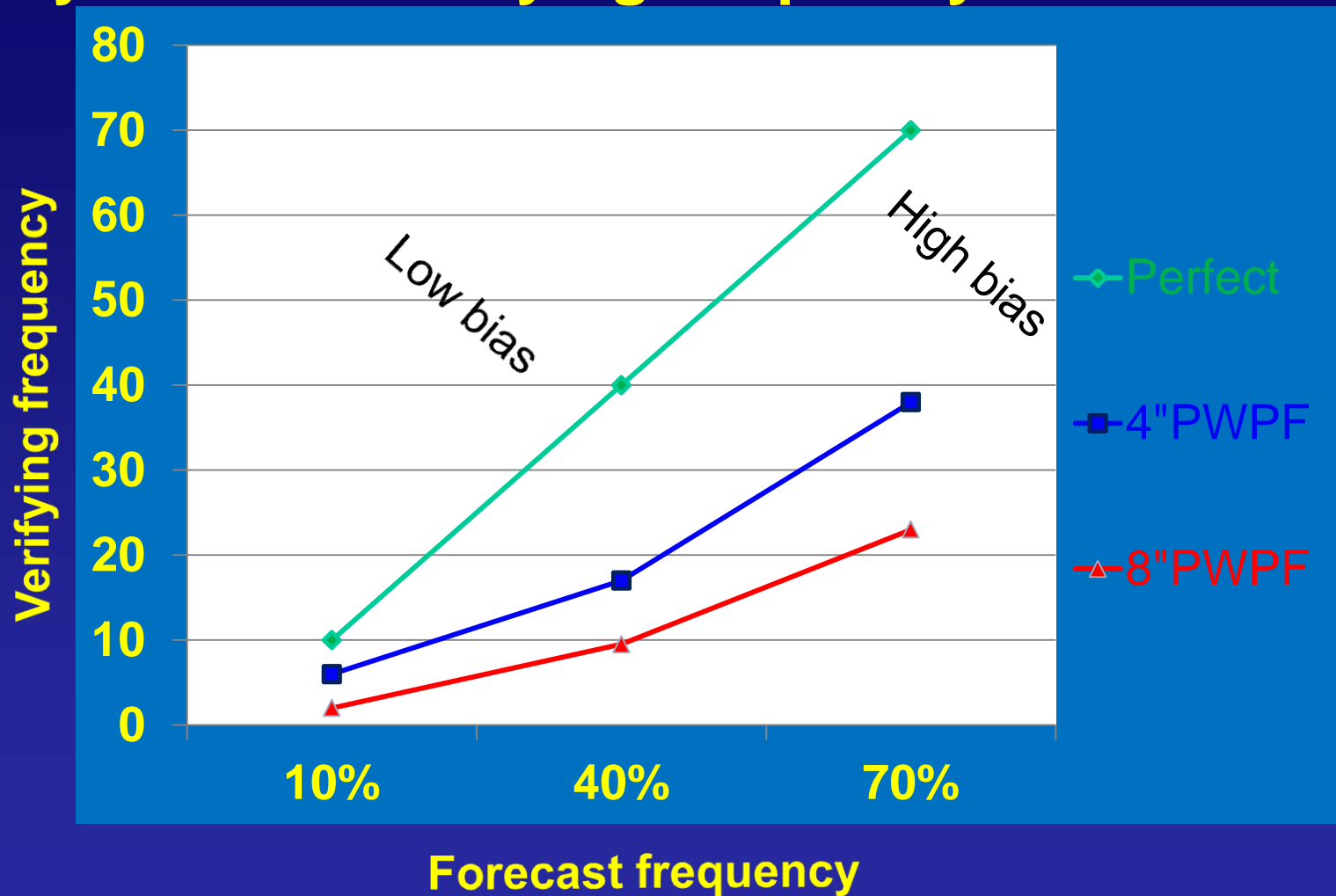
2012-13 Verification of WPC Low Tracks (position at each forecast hour)

WPC/Model Low Track Verification
2012-2013 Winter Weather Season



WPC Probabilistic Snowfall

Day 1 PWPF Verifying frequency over CONUS



Events forecast more frequently than observed

Verification Summary

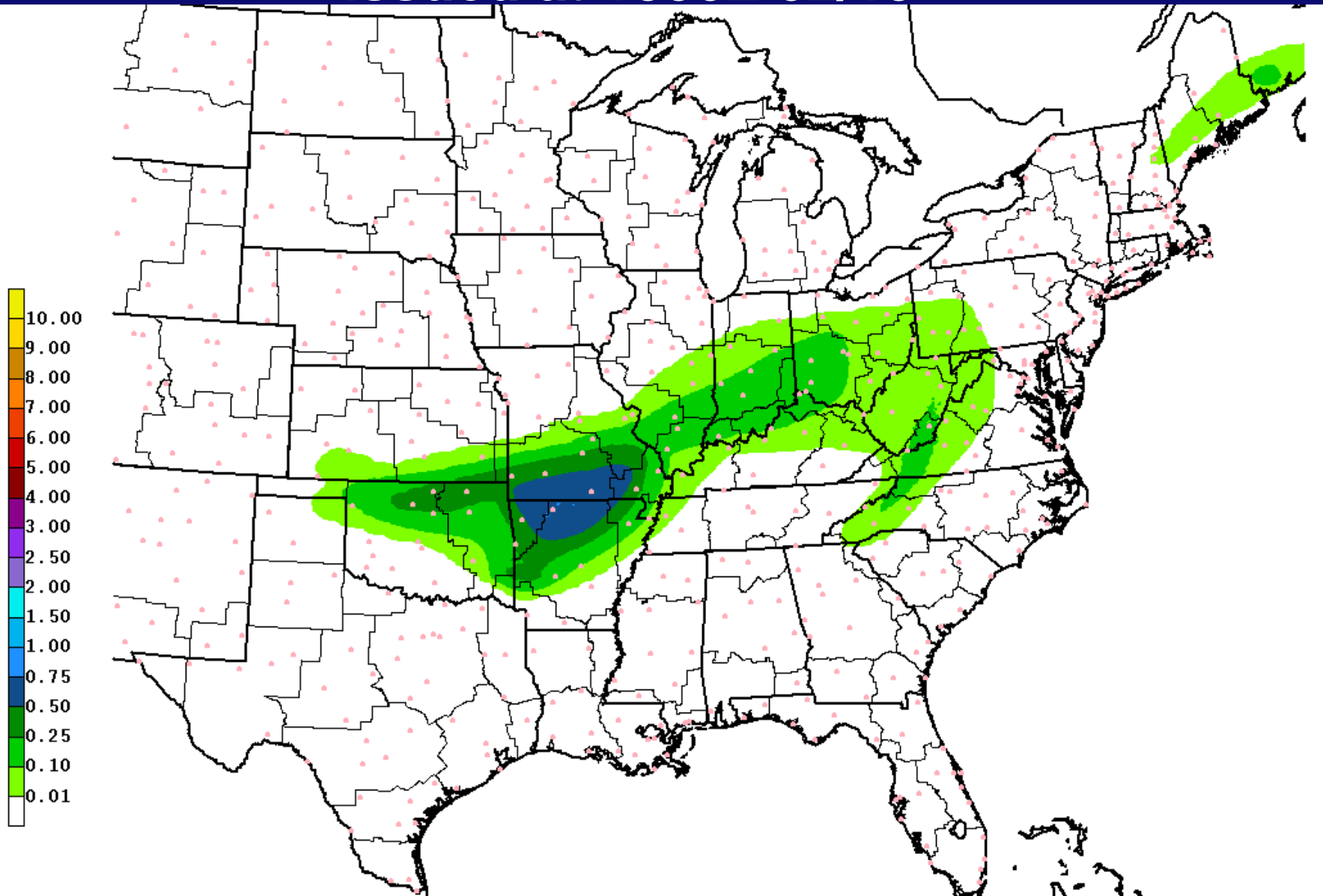
- **WPC added most value in the deterministic forecasts on days 2/3 vs. the consensus-based automated ensemble**
- **WPC forecaster edits to snow probability forecasts led to lower skill scores vs. the automated multi-model/multi-ensemble probabilities more often than not**
- **Consequently, forecasters are encouraged to minimize editing of probabilities (mostly for terrain)**

Case Study of Forecast Improvements on the Winter Weather Desk Following WFO Collaboration on 2/19/13

- WPC coordinated with the following WFO's during a conference call Feb. 19, 2013 : UNR, ABR, FSD, LBF, OMA, GID, DMX, EAX, SGF, LSX, ICT, DDC, GLD, LZK, TSA, PAH.
- WFOs SGF, PAH, TSA, and LZK expressed concern that more sleet would be mixing in with the freezing rain (if not become the predominant p-type) at times.
- As a result, WPC **lowered** the ice accumulation forecast across southern Missouri and extreme southeastern Kansas

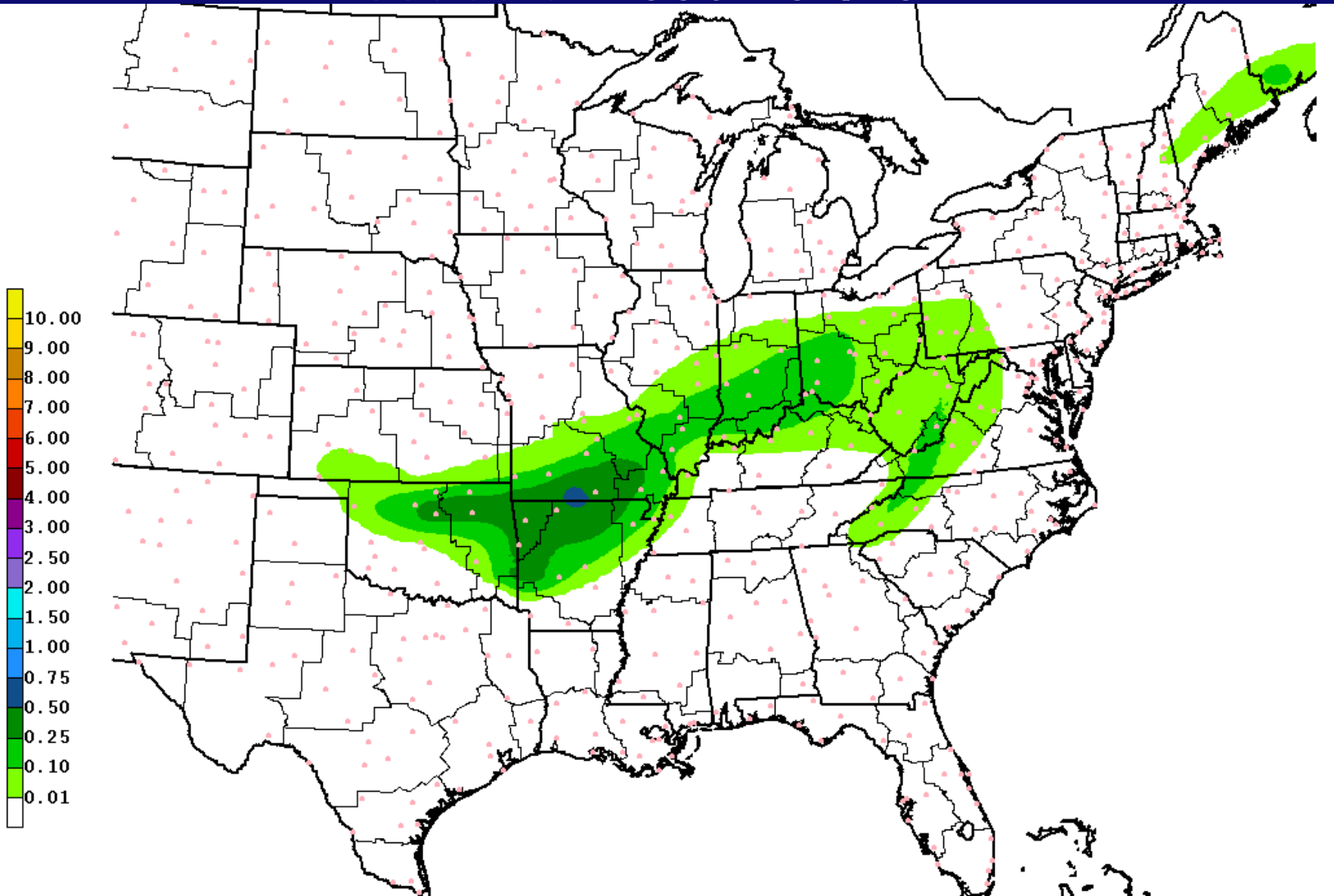
Initial WWD Ice Accumulation Forecast

3-day total through 00Z 02/23/2013, issued at 1830Z 02/19



Revised Ice Accumulation Forecast

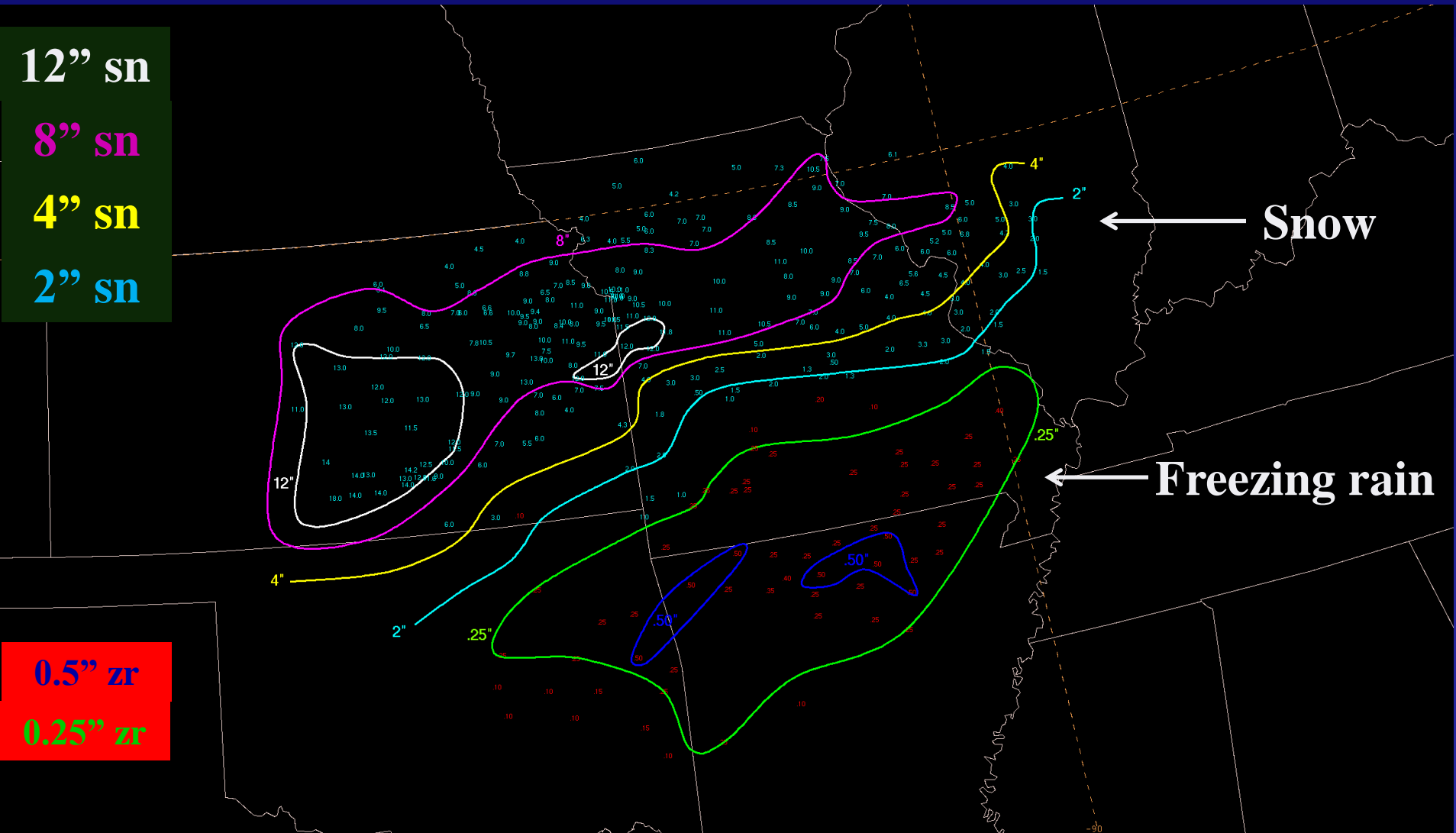
3-day total through 00Z 02/23/2013, issued at 1956Z 02/19



Observed Snowfall/Ice Accumulations

48 hr totals through 6 pm CST

02/21/2013



Winter Weather Desk Collaboration Resources

We have scheduled WFO collaboration after the day 3 internal snow/ice forecasts are issued, about 0615-0815z and 1815-2015z (other times negotiated)

**Phone for individual WFO collaboration: WPC Forecast
Operations Branch (301) 683-1530**

12planet hpc_wwd (until change to wpc_wwd)

**Conference calls: Multi-office conference call phone
866-763-1213 WFO Passcode 524234#**

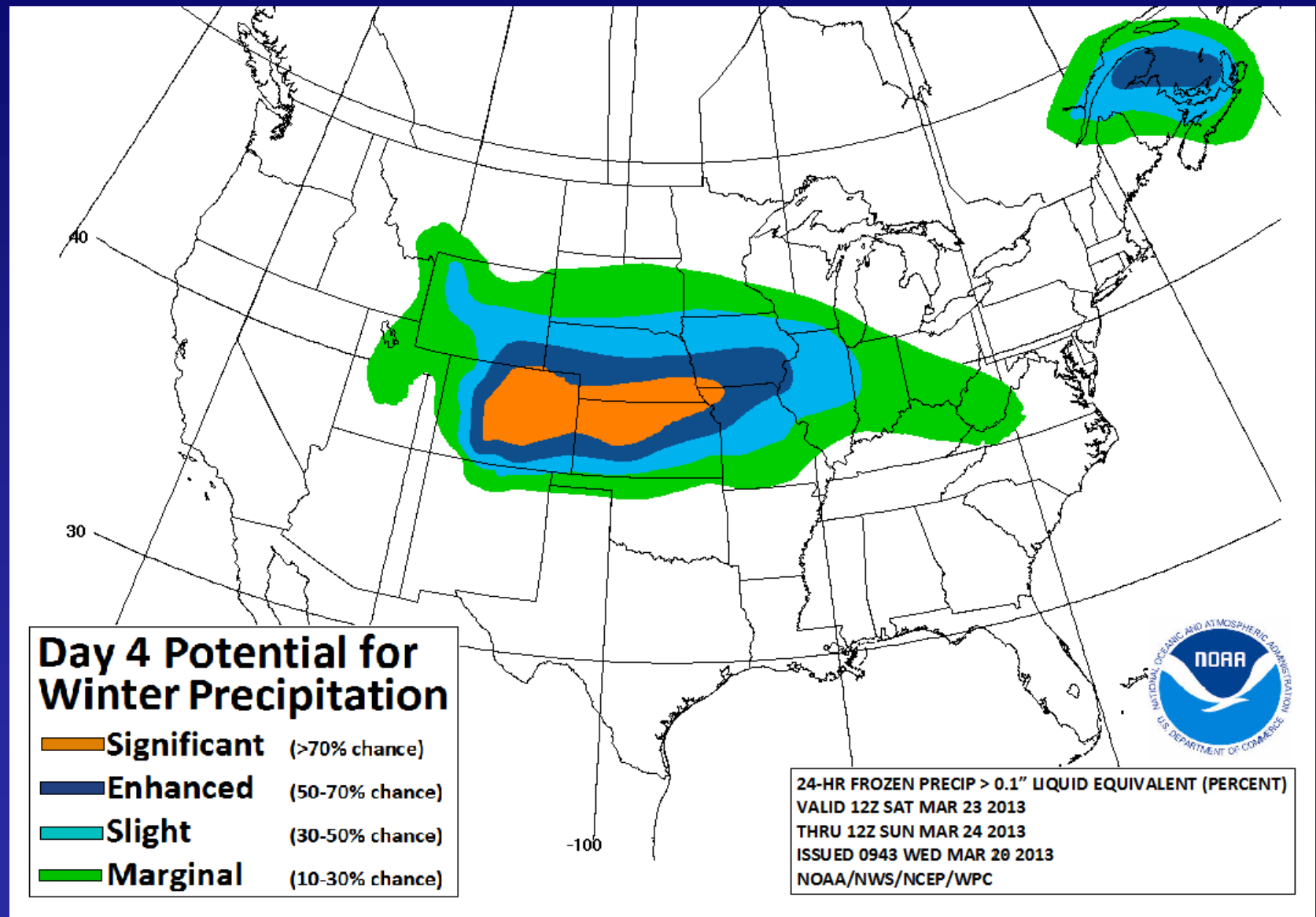
***Let us know if you would like to initiate a conference call.**

**Desk focal point Dan.Petersen@noaa.gov
Science and Operations Officer Wallace Hogsett
Wallace.A.Hogsett @noaa.gov**

Experimental Forecasts for 2013-2014

- In an effort to determine winter weather forecast skill for days 4-7, we will be issuing internal probabilistic forecasts of combined snow/freezing rain totals of 0.10" liquid equivalent for each 24 hour period for
 - Day 4
 - Day 5
 - Day 6
 - Day 7

Probability of combined snow/ice of 0.10" Liquid Equiv. for each 24 hour pd

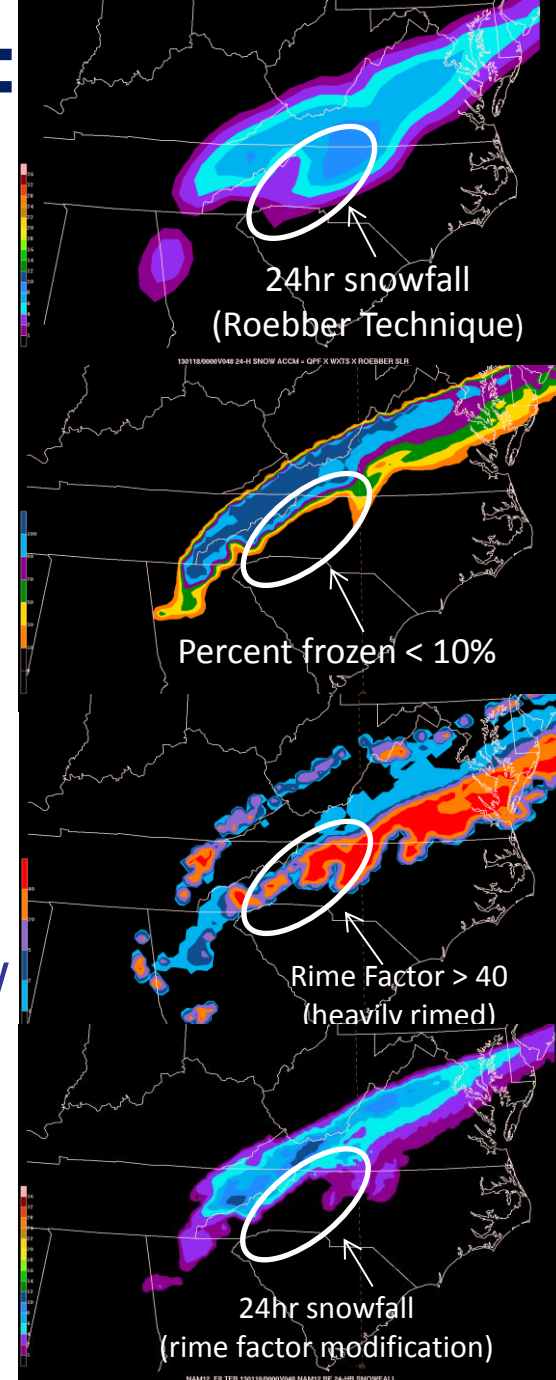


Experimental Forecasts for 2013-2014

- Initial methodology will be similar to probabilistic rain forecast, with WPC qpf as the mode (given most weight)
- All ECMWF and GEFS members used to calculate probability of QPF>0.10"
- Precipitation type is based on GEFS members
- Edits based on operational ECMWF, ensemble clusters of ECMWF snowfall forecasts, operational GFS (any non-GEFS solutions)

2013 Winter Weather Experiment: Rime Factor-Modified Snow

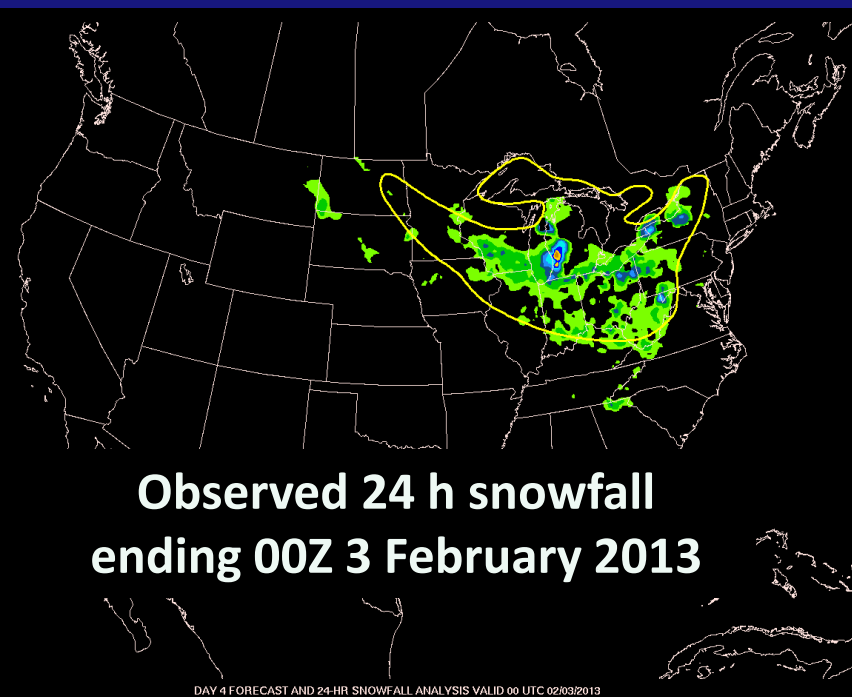
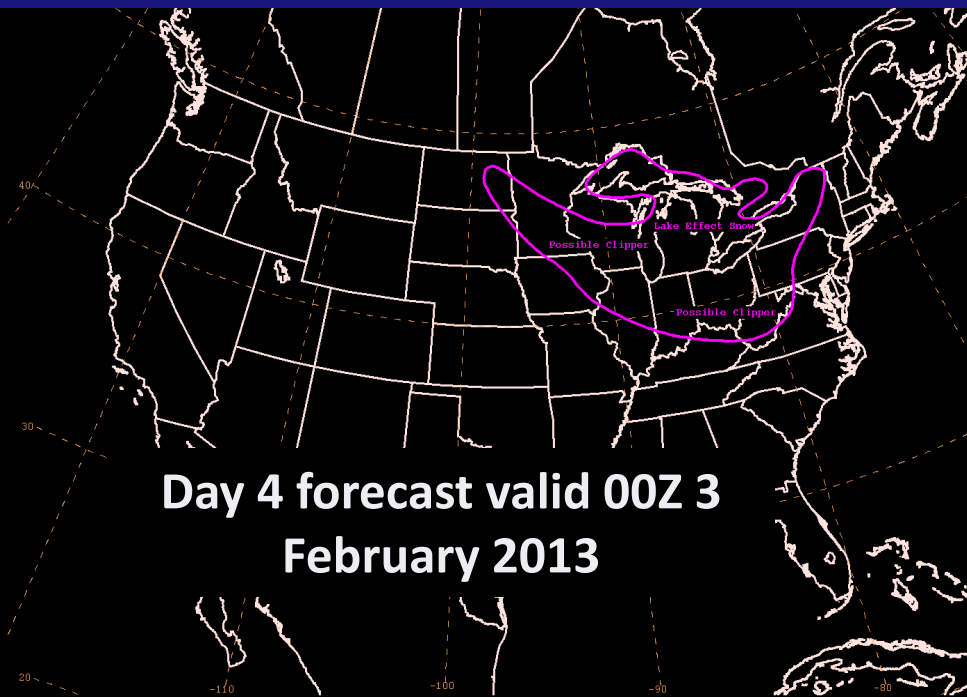
- Modifies the SLR in the NAM by accounting for Instantaneous:
 - Percent frozen precipitation
 - Rime factor
- Potential Benefits:
 - Data available hourly
 - More representative of how much of each precipitation type accumulates
 - Snow accumulations are lowered when snow mixed with ice pellets and/or rain
 - This will be implemented in AWIPS NAM snow accumulations Q3 2014
 - Testing forthcoming in the SREF and GFS



Winter Weather Experiment 2013

- Explored the utility of Day 4 and Day 5 winter weather outlook

Evolved to probability of 0.10" liquid-equivalent falling as frozen precipitation



Summary

- **Verification leading to operations changes**
 - forecaster improvements are primarily in editing the deterministic snow forecasts (not editing probability forecasts)
- **WFO Collaboration helps improve our forecasts (please provide your model preferences)**
- **Expanded product suite**
 - probabilistic snow/freezing rain forecast suite to include 24, 48 and 72 hour totals out thru day 3
 - Day 4-7 winter weather outlook (internal) introduced in 2013-14
- **Winter Weather Experiment**
 - showed use of fraction of frozen precipitation and rime factor can be used to improve snow forecasts (implemented in next NAM upgrade).
 - 2014 Winter Weather Experiment coming in January-February

Questions or Comments?

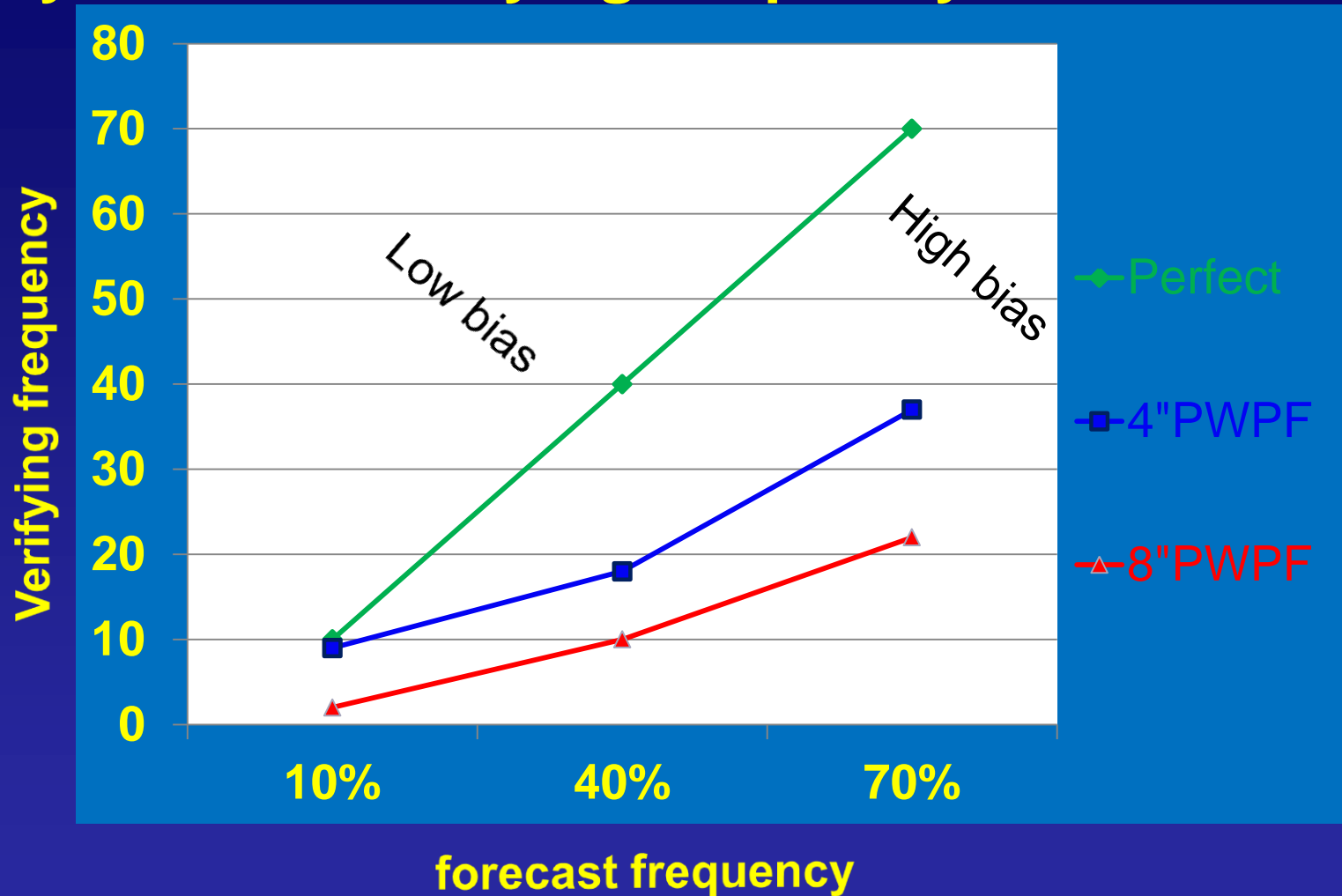
Dan.Petersen@noaa.gov

WPC Forecast Operations Branch

(301) 683-1530

WPC Probabilistic Snowfall

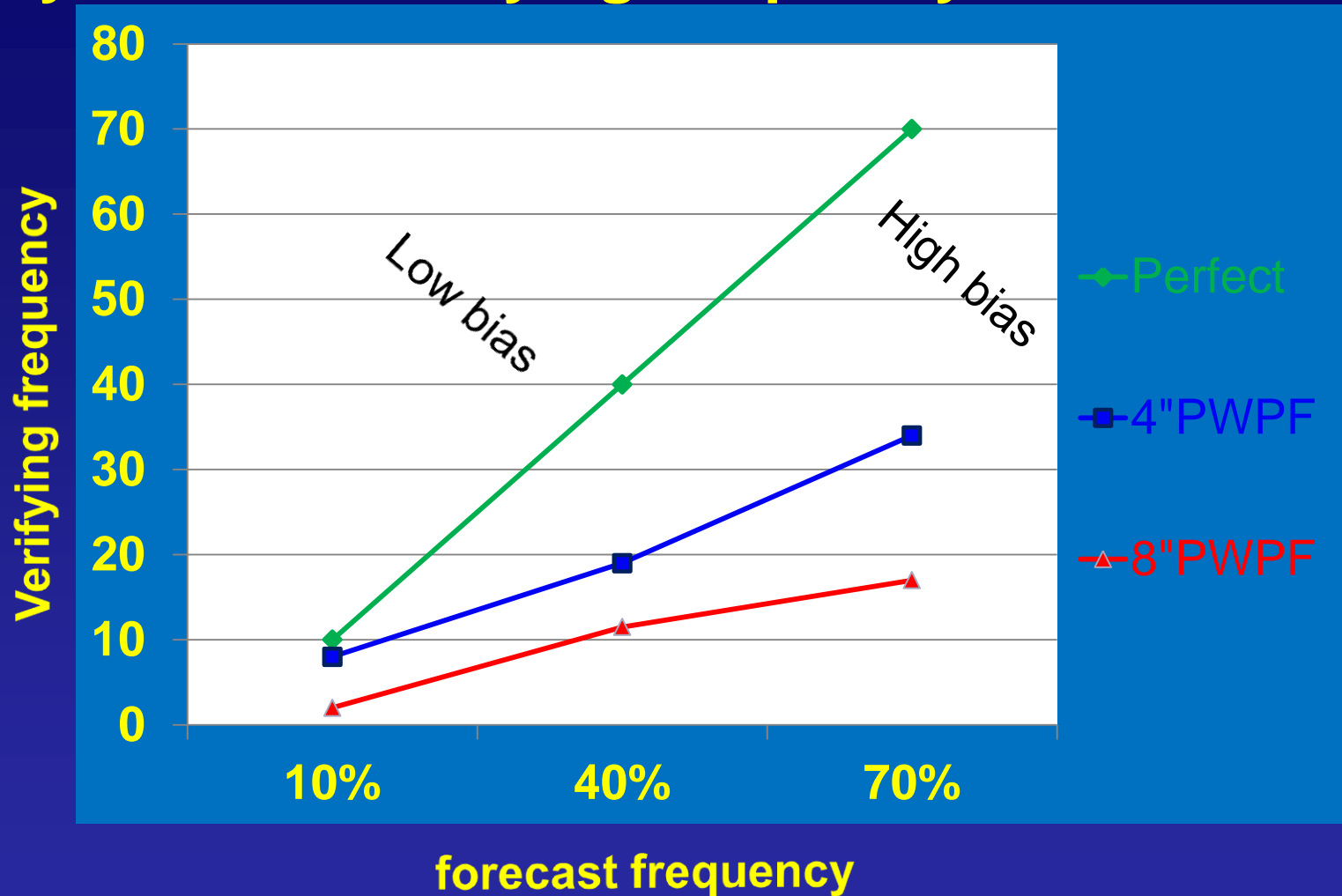
Day 2 PWPF Verifying frequency over CONUS



Events forecast more frequently than observed

WPC Probabilistic Snowfall

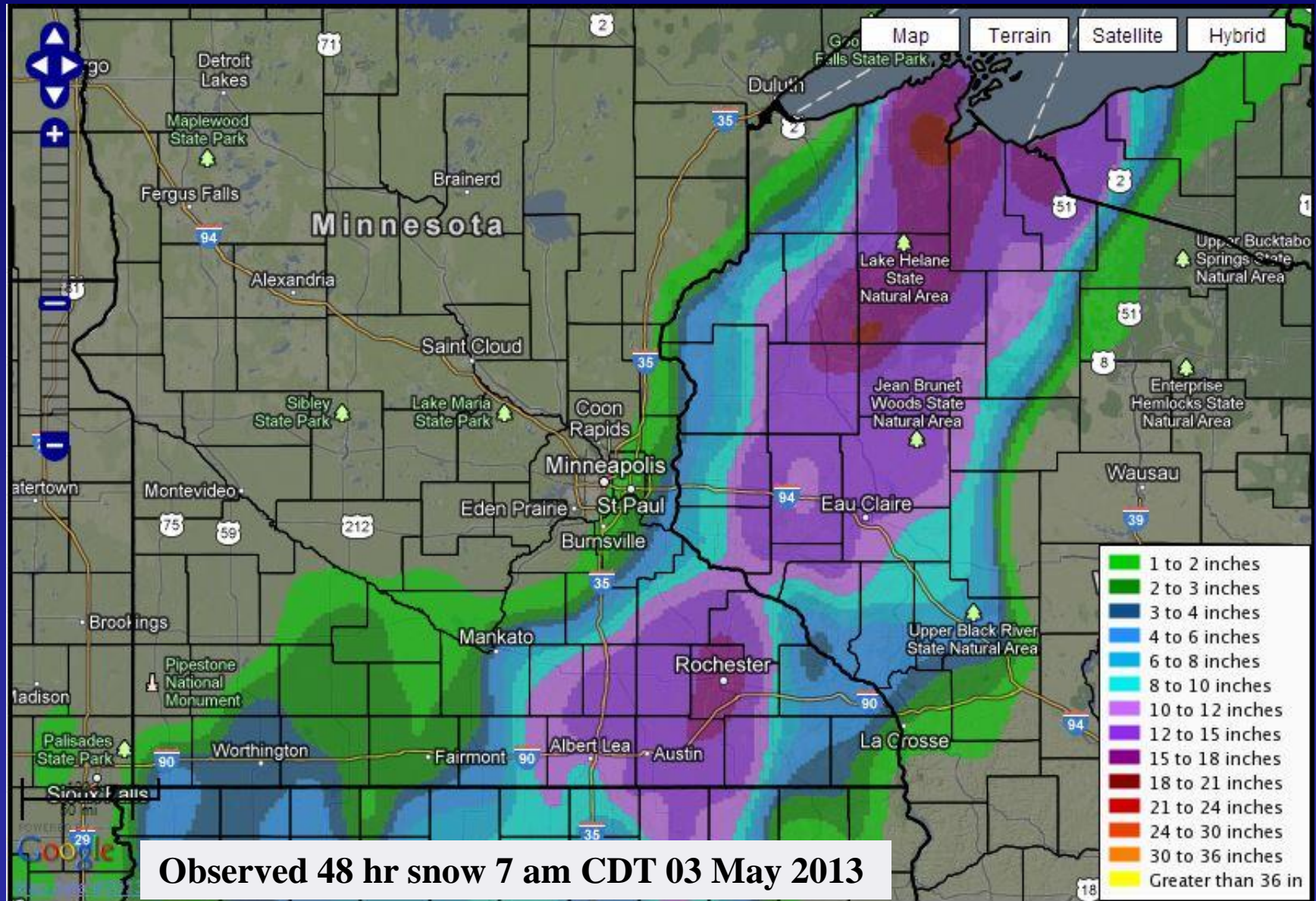
Day 3 PWPF Verifying frequency over CONUS

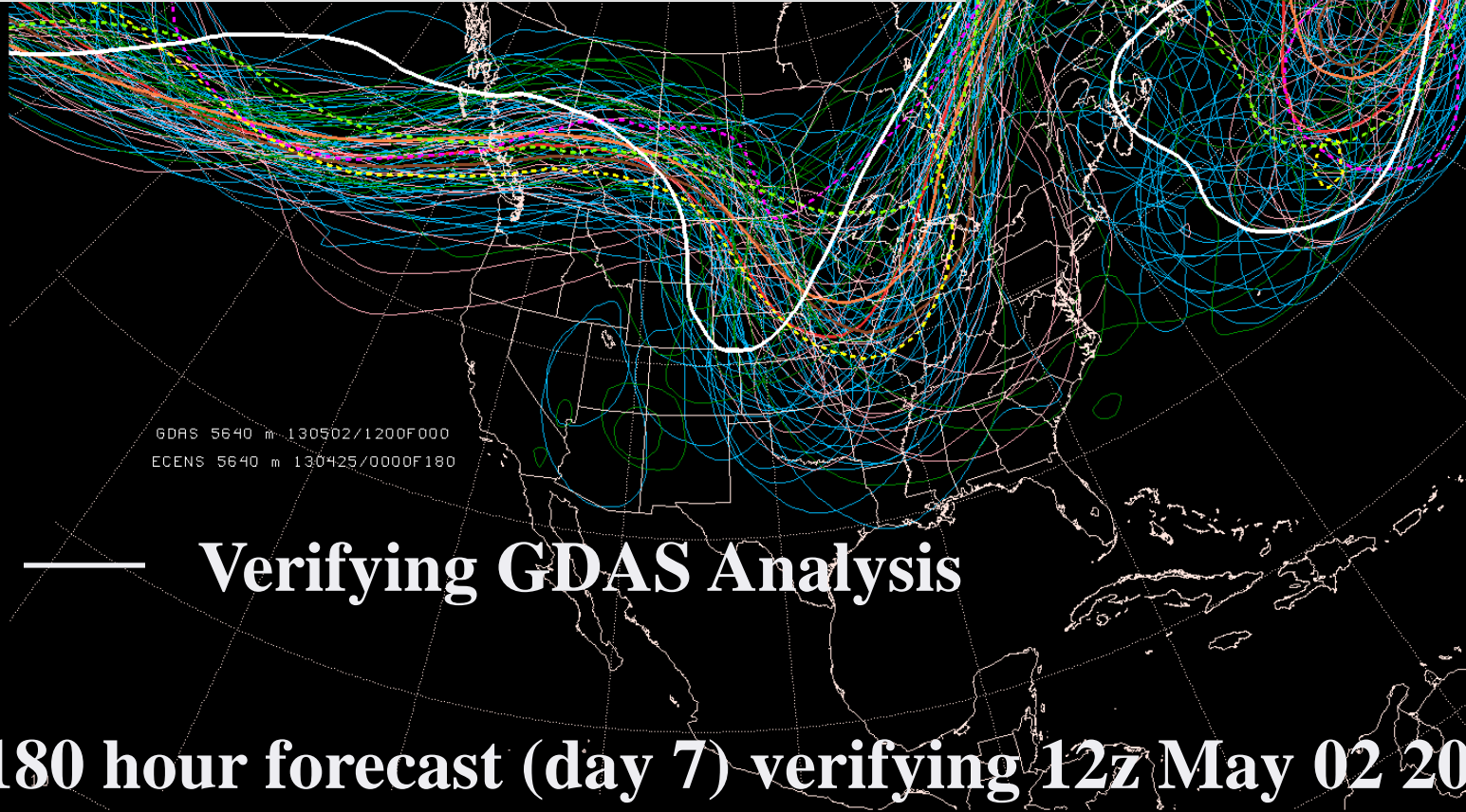
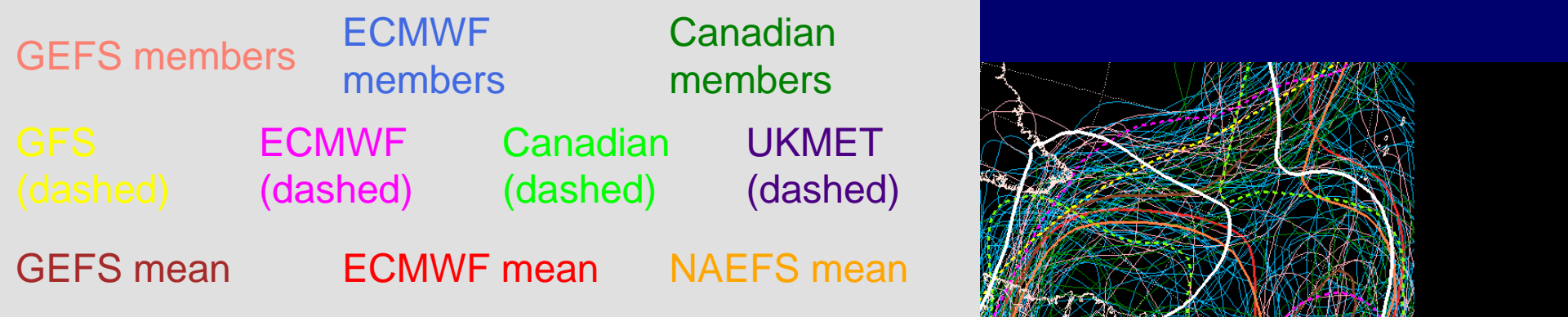


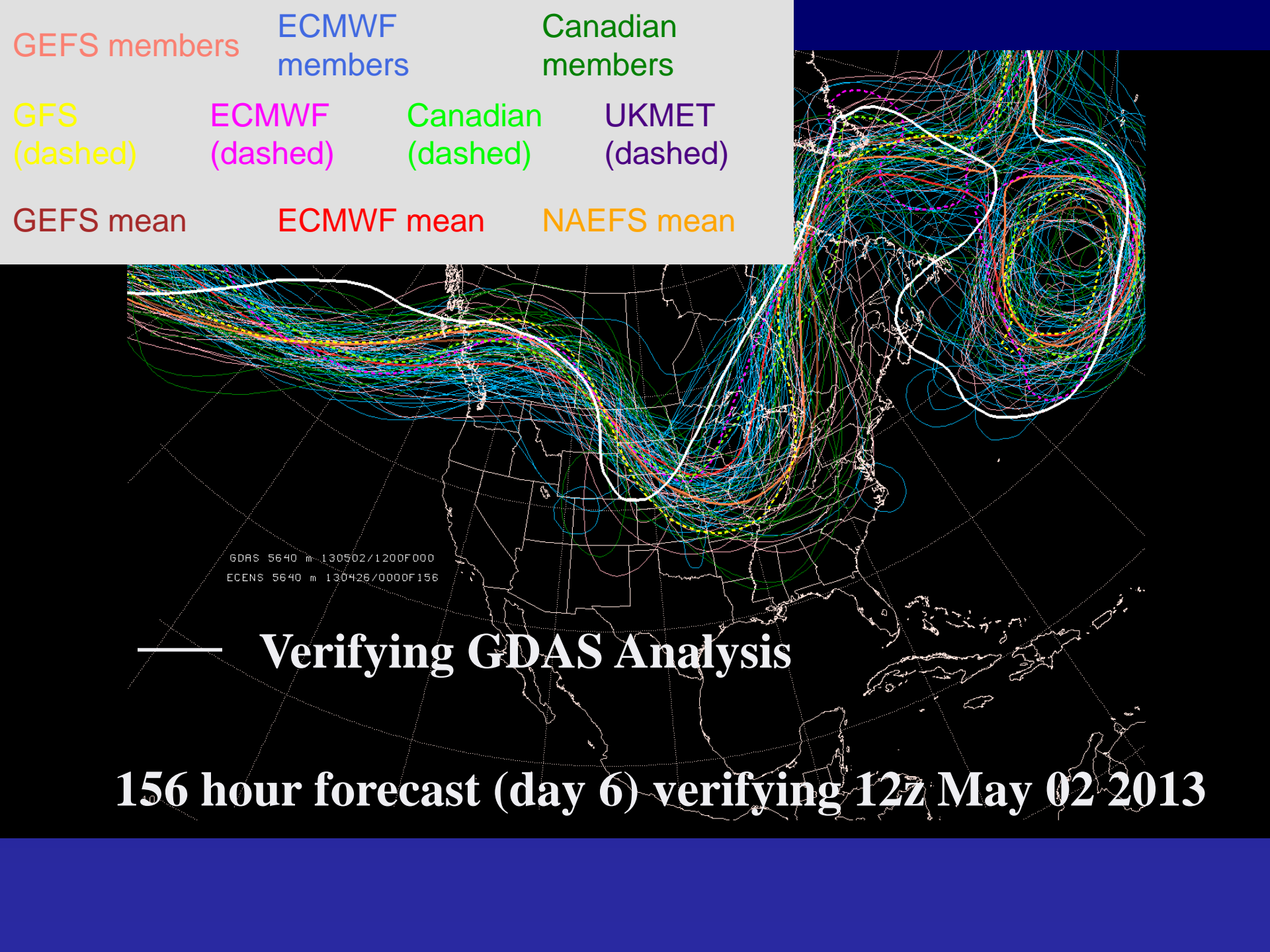
Events forecast more frequently than observed

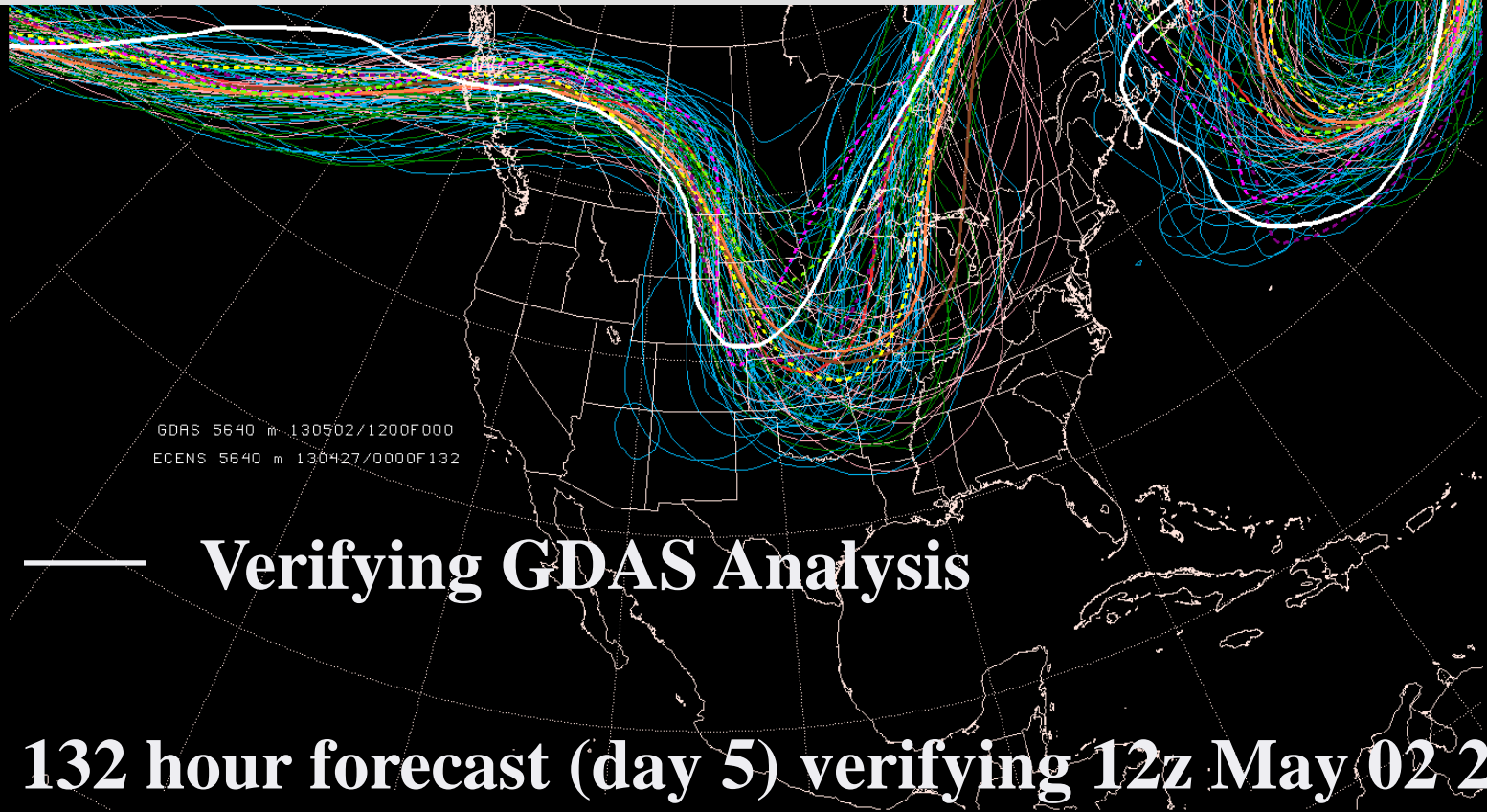
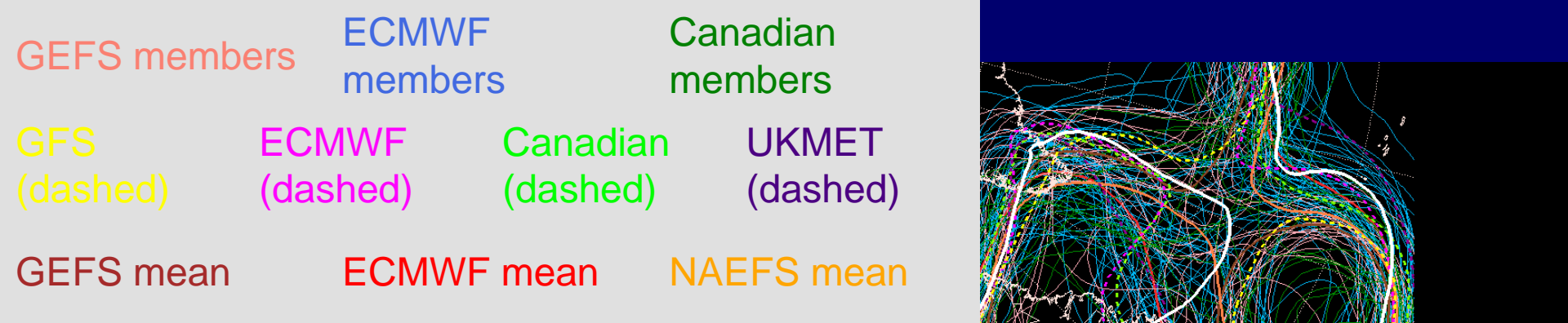
Historic May 2013 snowfall in MN/WI:

All-time record snowfall for a May event-17.2" Dodge Center, MN

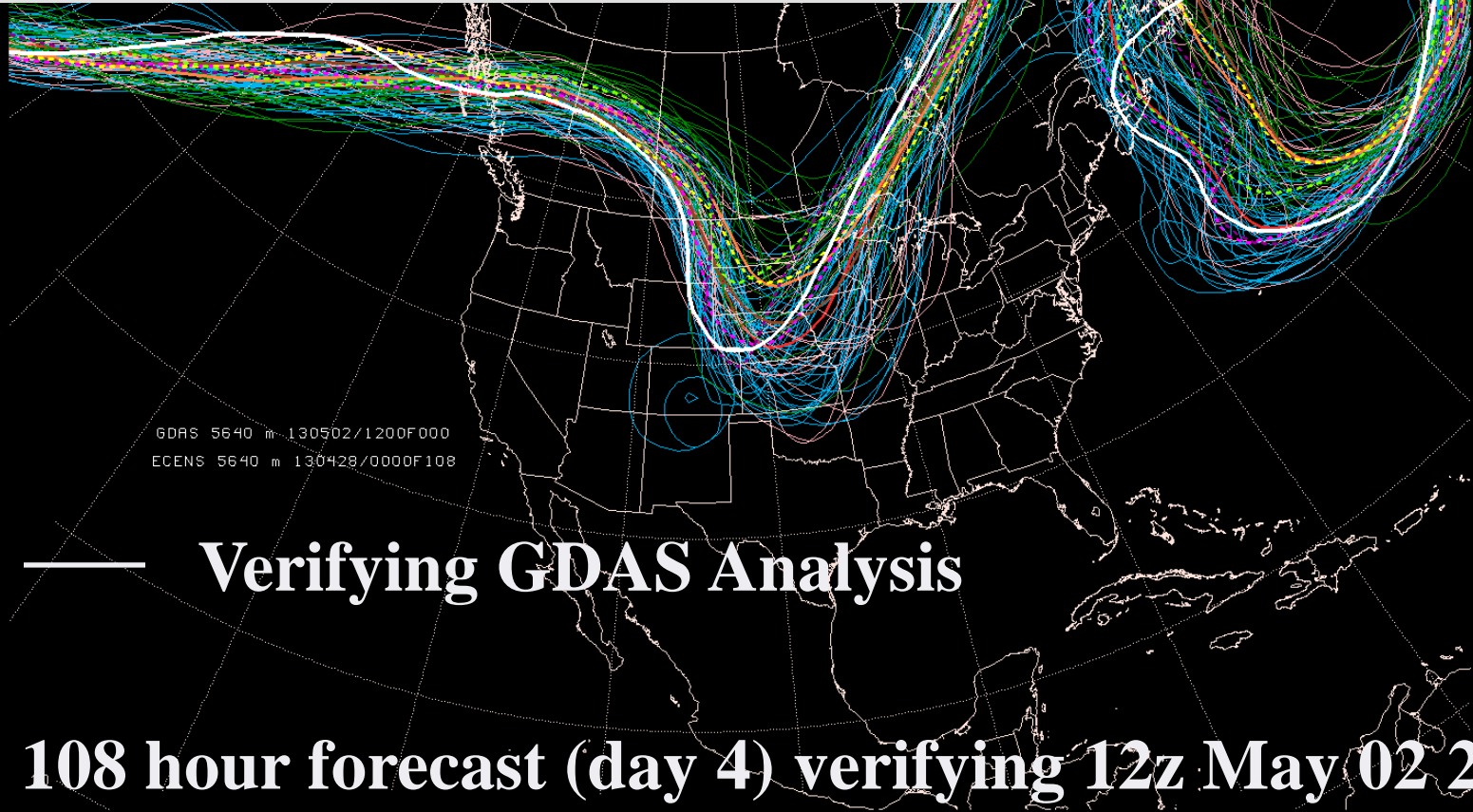


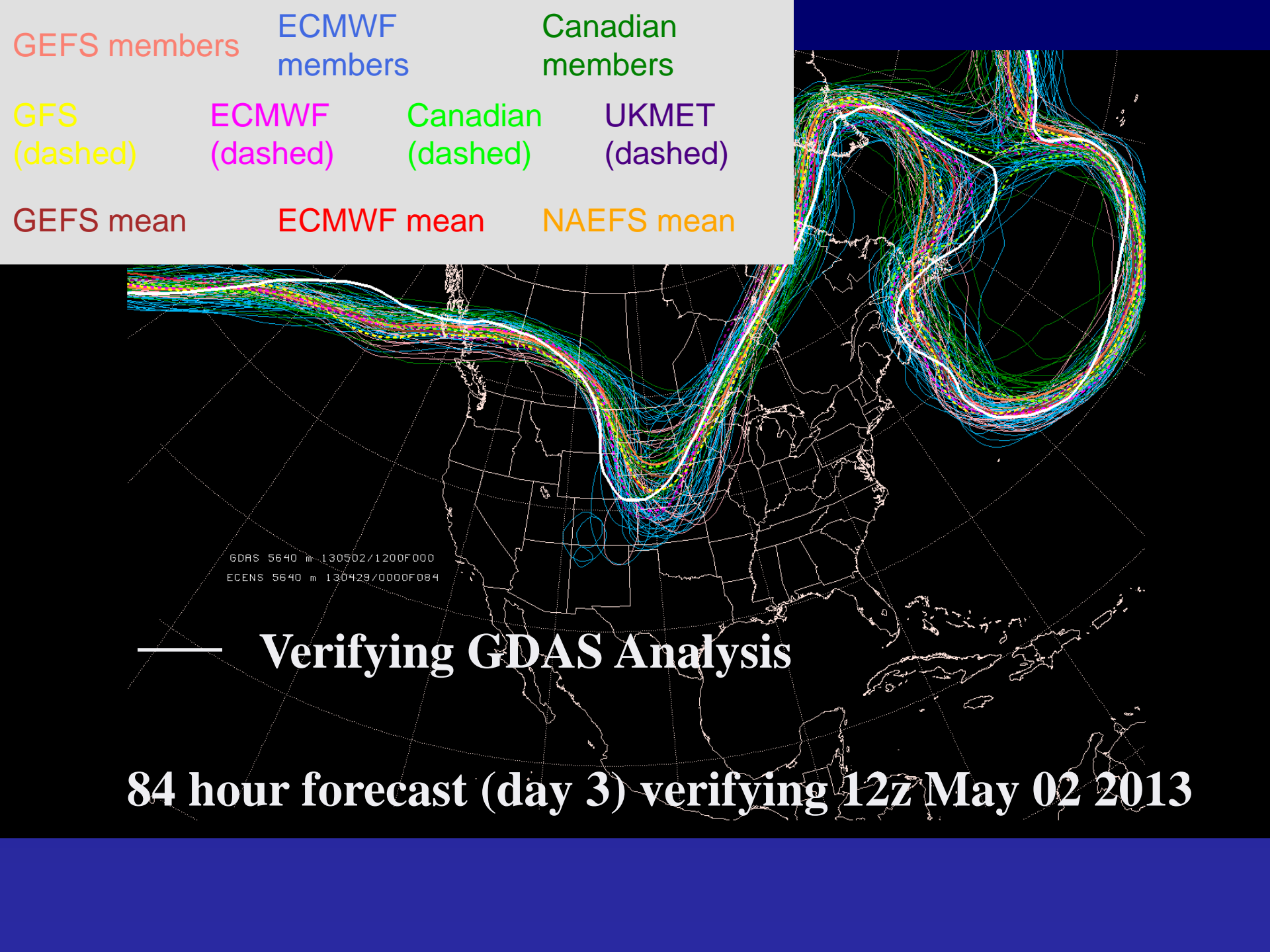


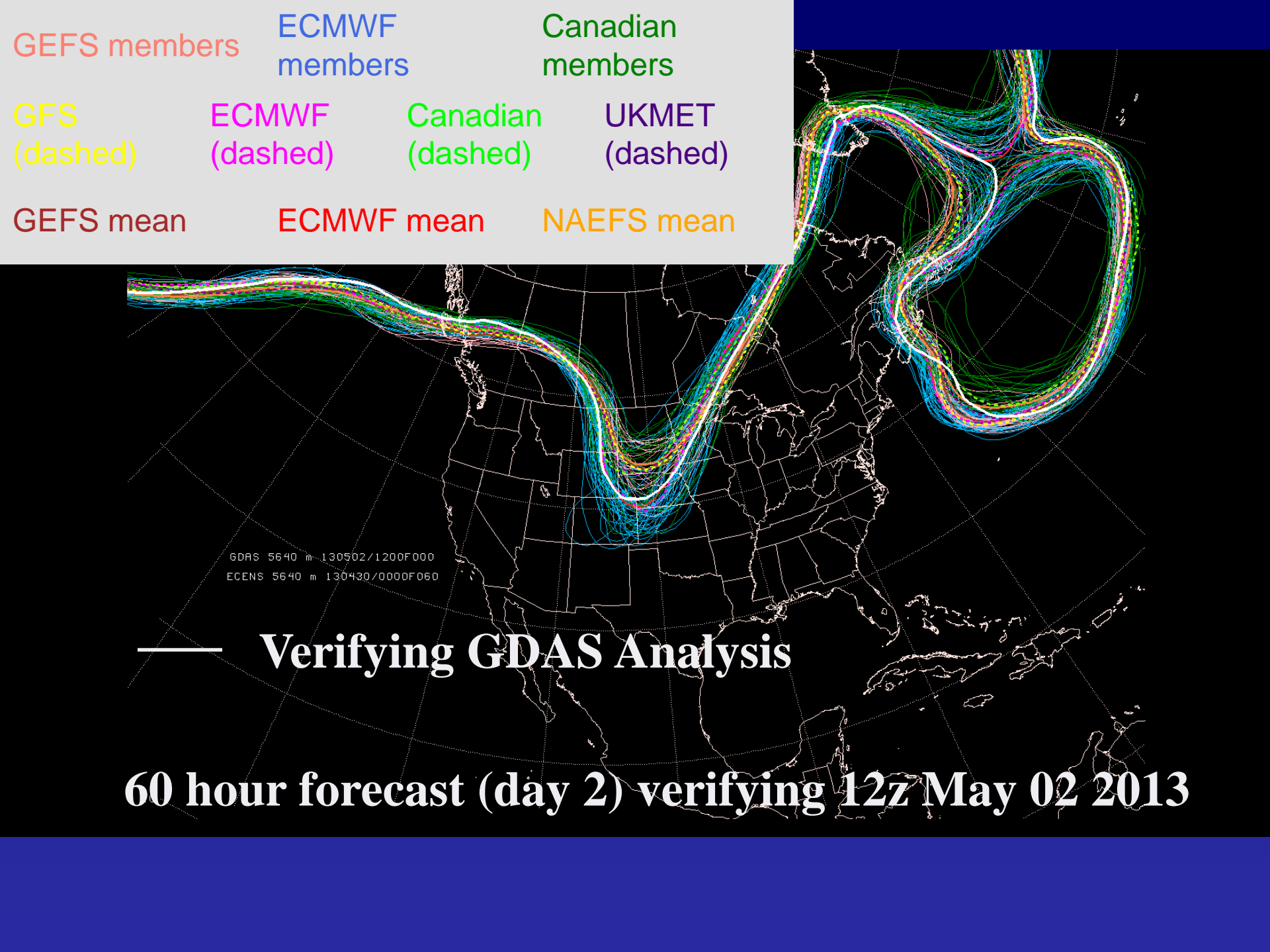


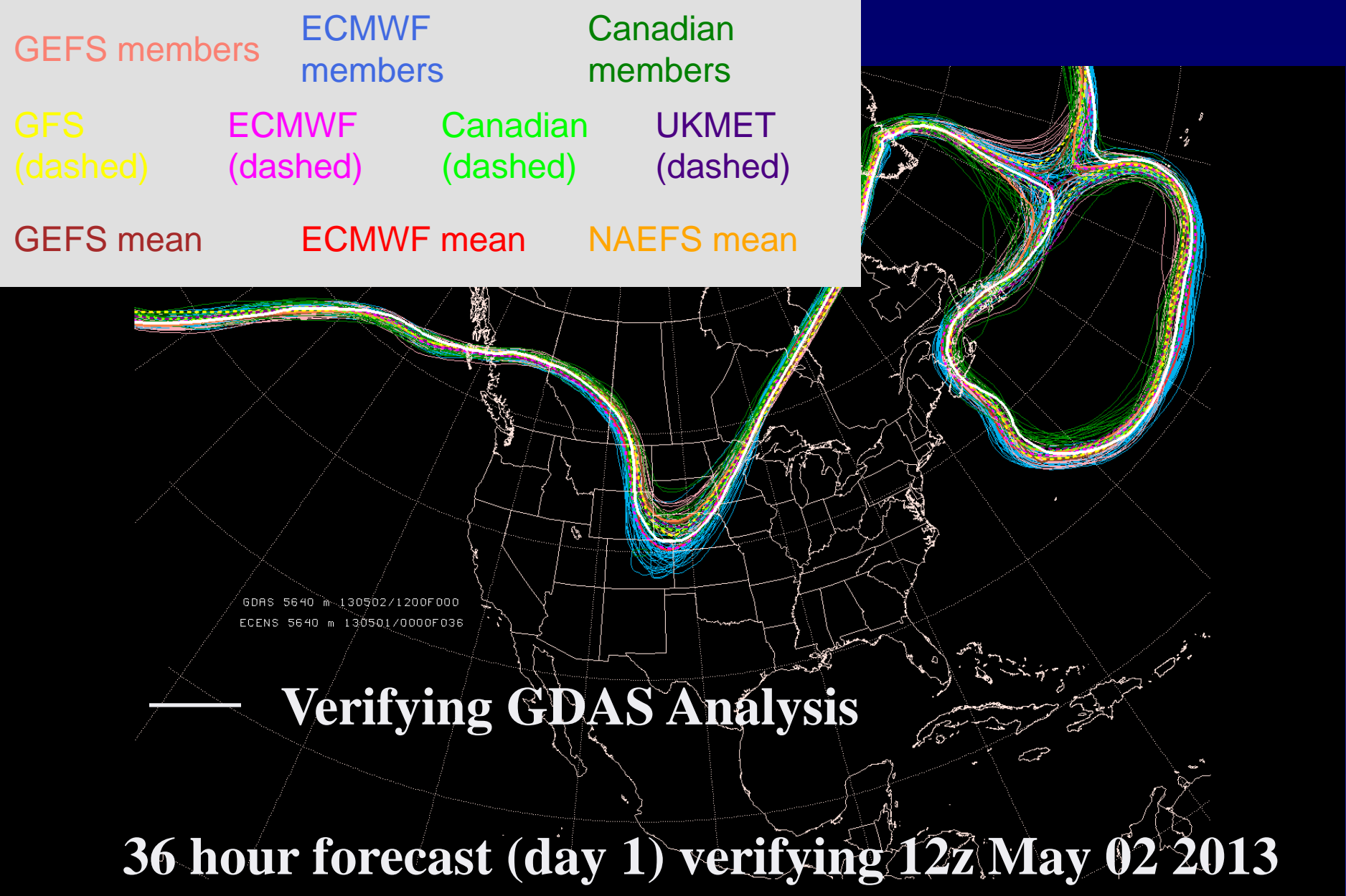


GEFS members	ECMWF members	Canadian members	
GFS (dashed)	ECMWF (dashed)	Canadian (dashed)	UKMET (dashed)
GEFS mean	ECMWF mean	NAEFS mean	

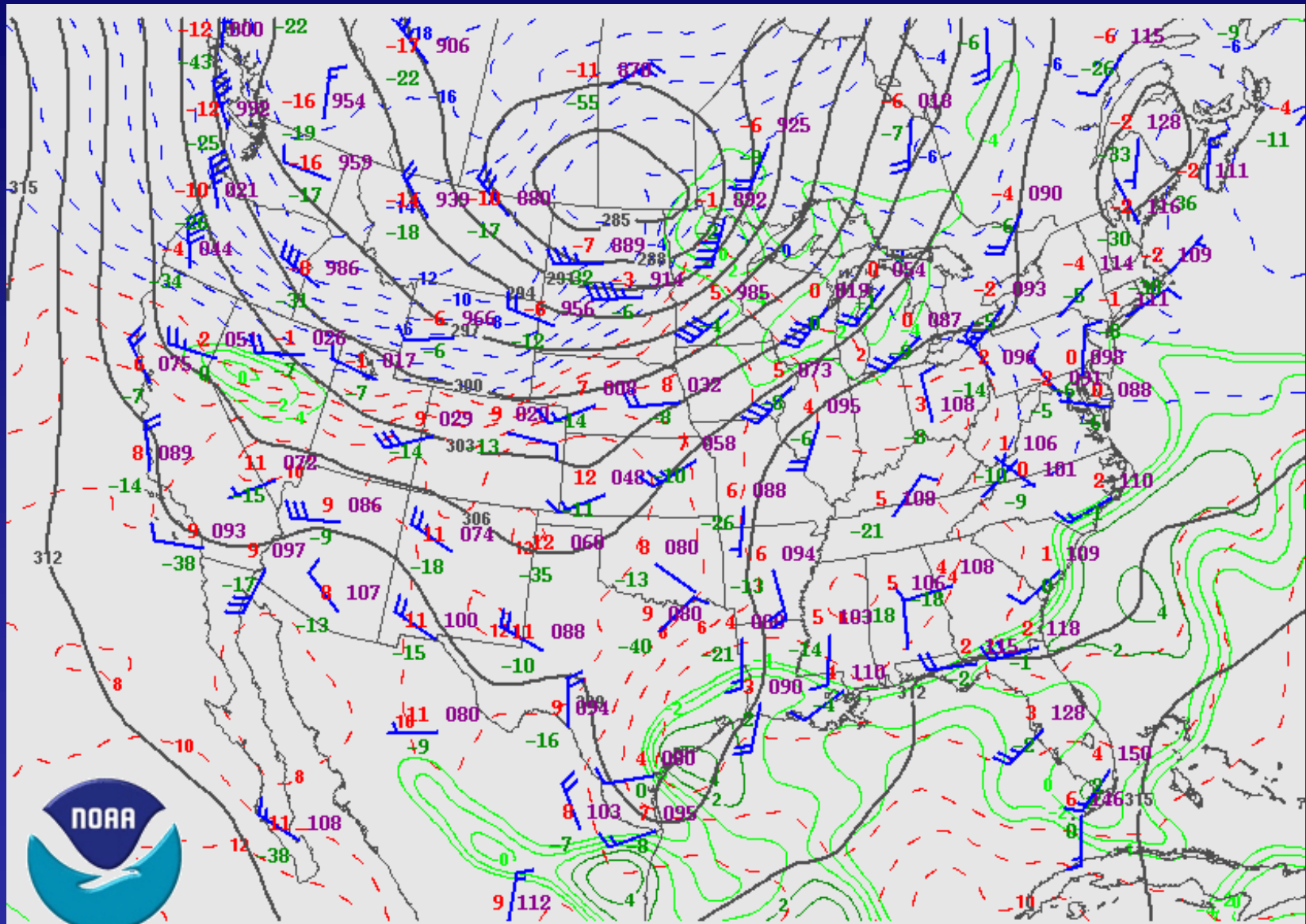








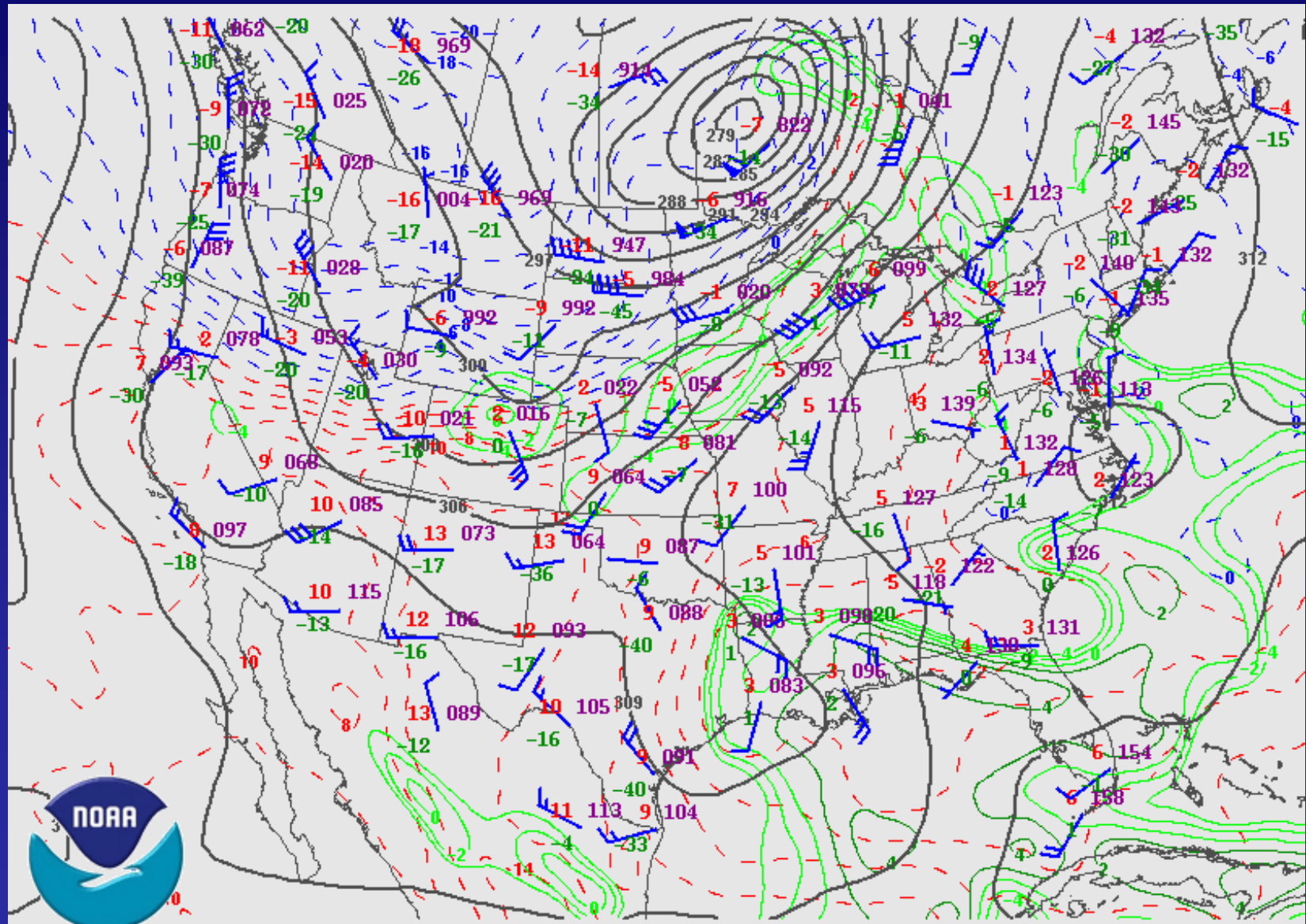
700 mb analysis 30 Apr 2013 12z



National Weather Service
Storm Prediction Center

130430/1200 700 MB UA OBS, HGHTS, TEMPS, Td>=-4

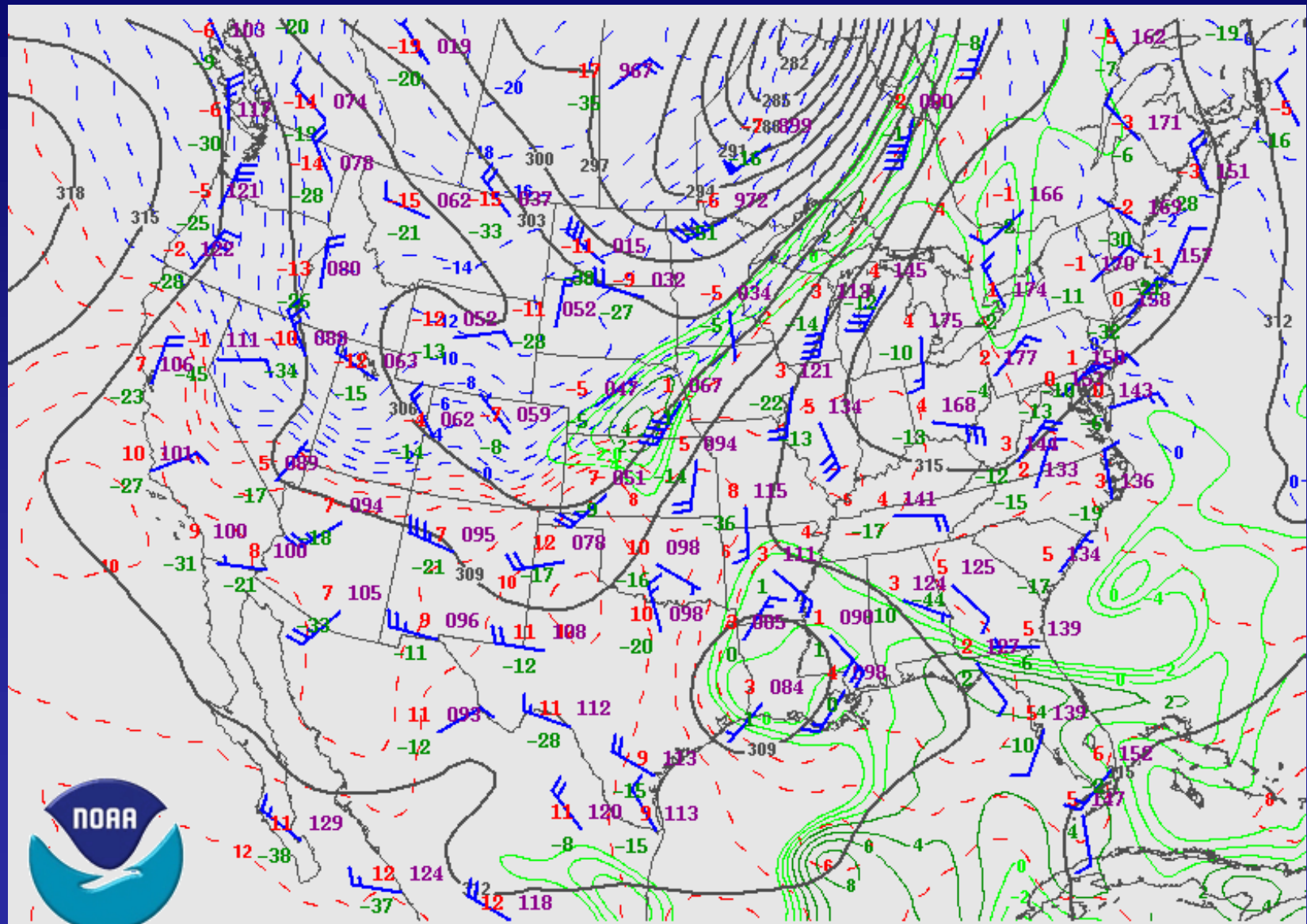
700 mb analysis 01 May 2013 00z



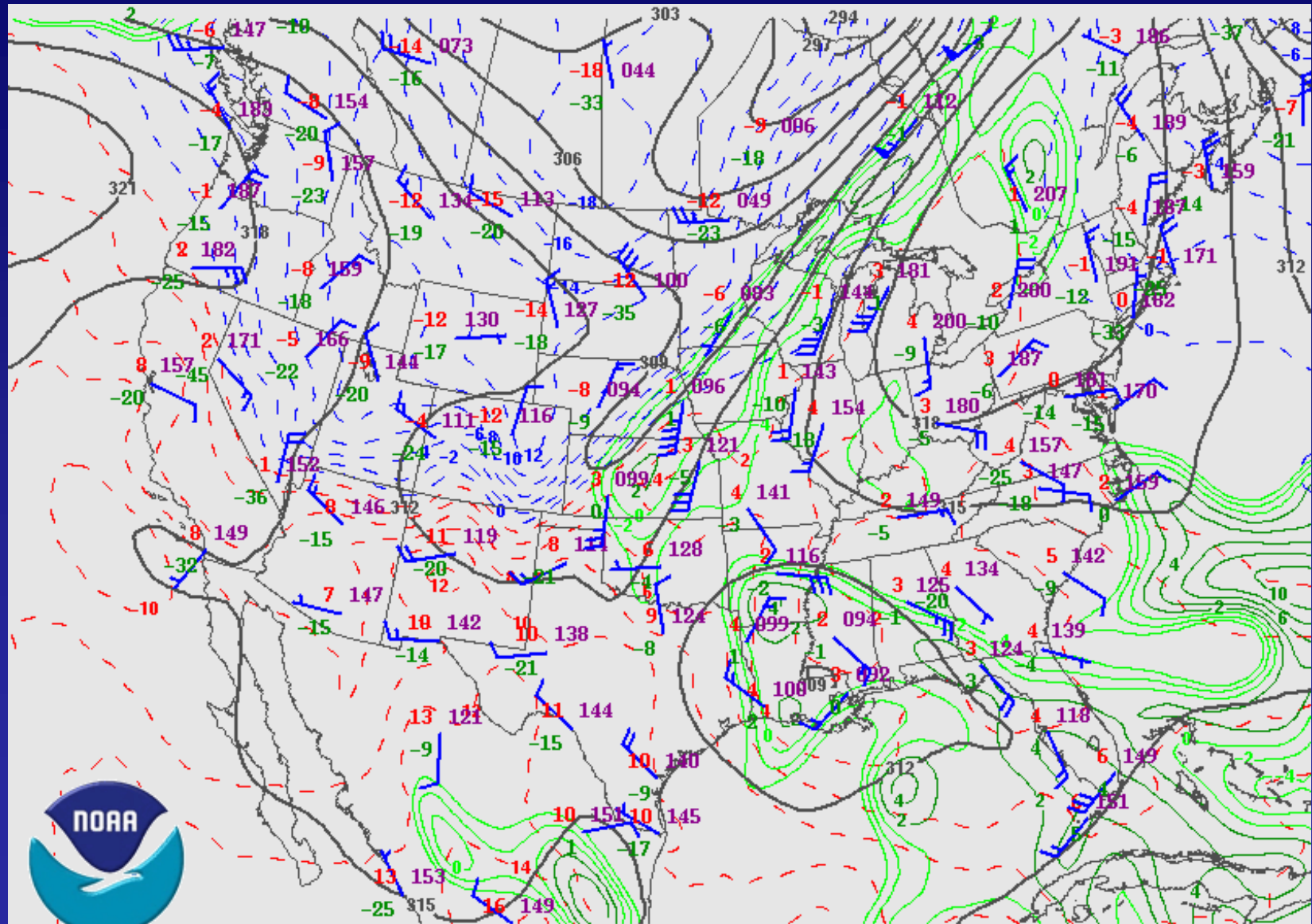
National Weather Service
Storm Prediction Center

130501/0000 700 MB UA OBS, HGHTS, TEMPS, Td>=-4

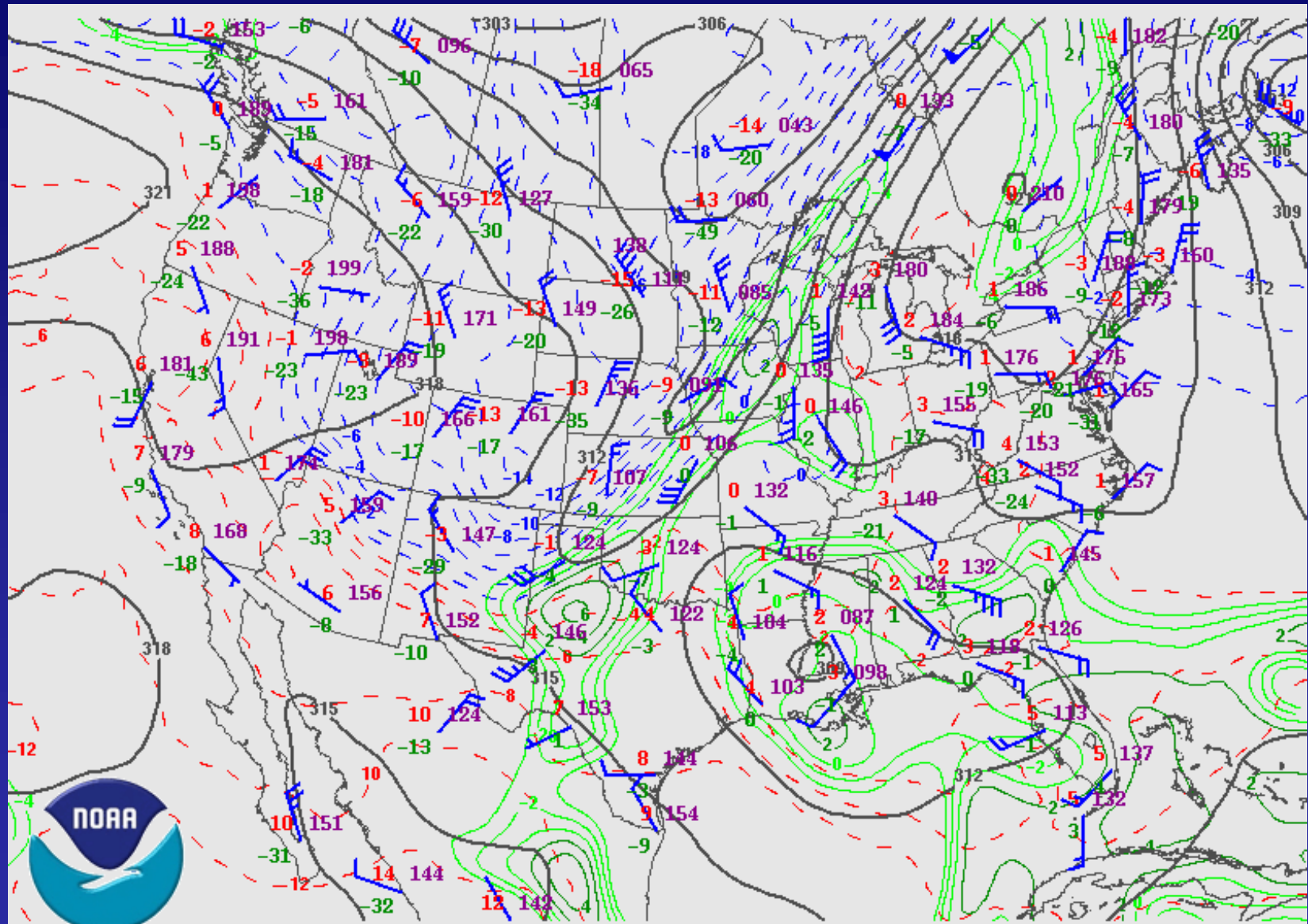
700 mb analysis 01 May 2013 12z



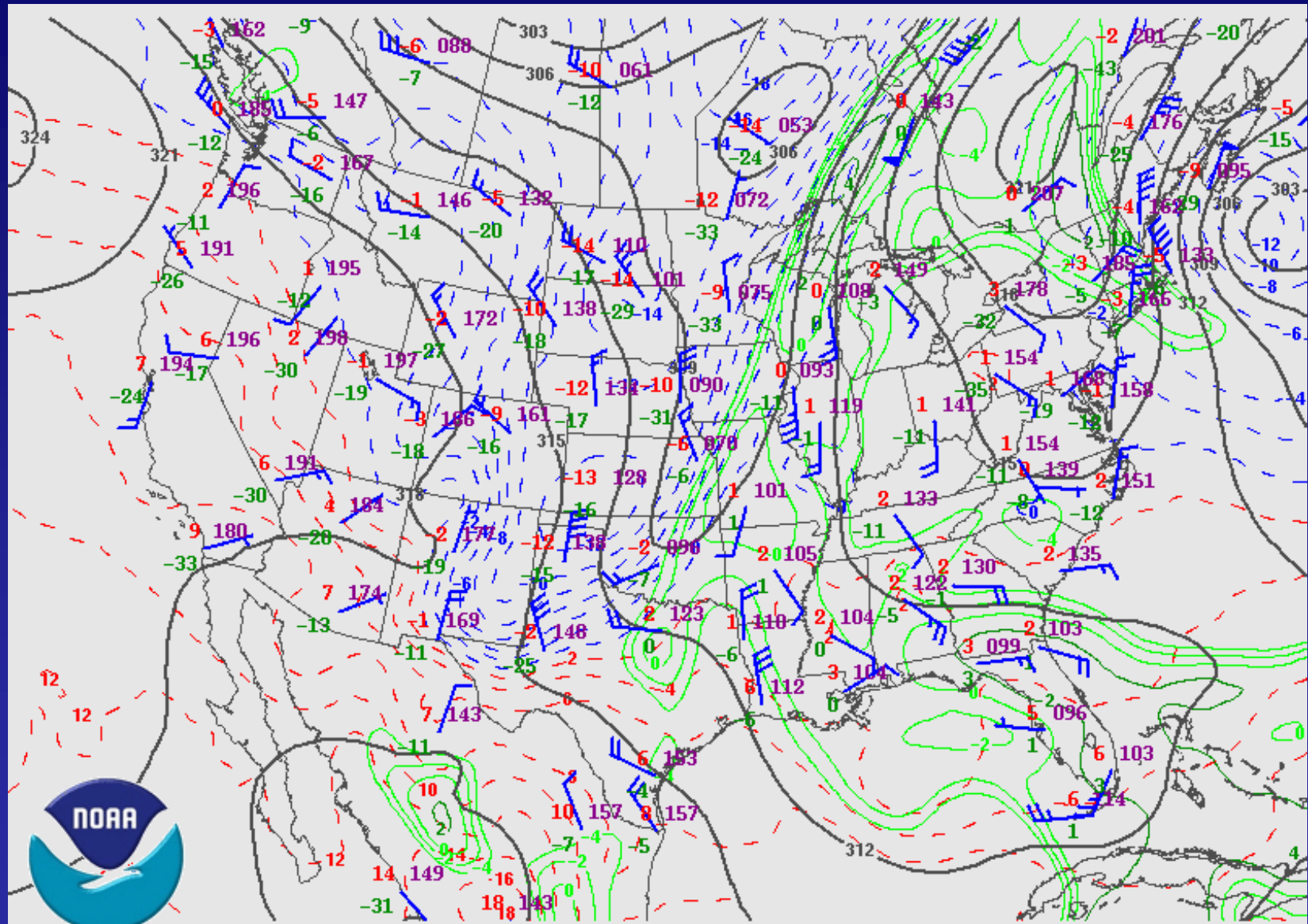
700 mb analysis 02 May 2013 00z



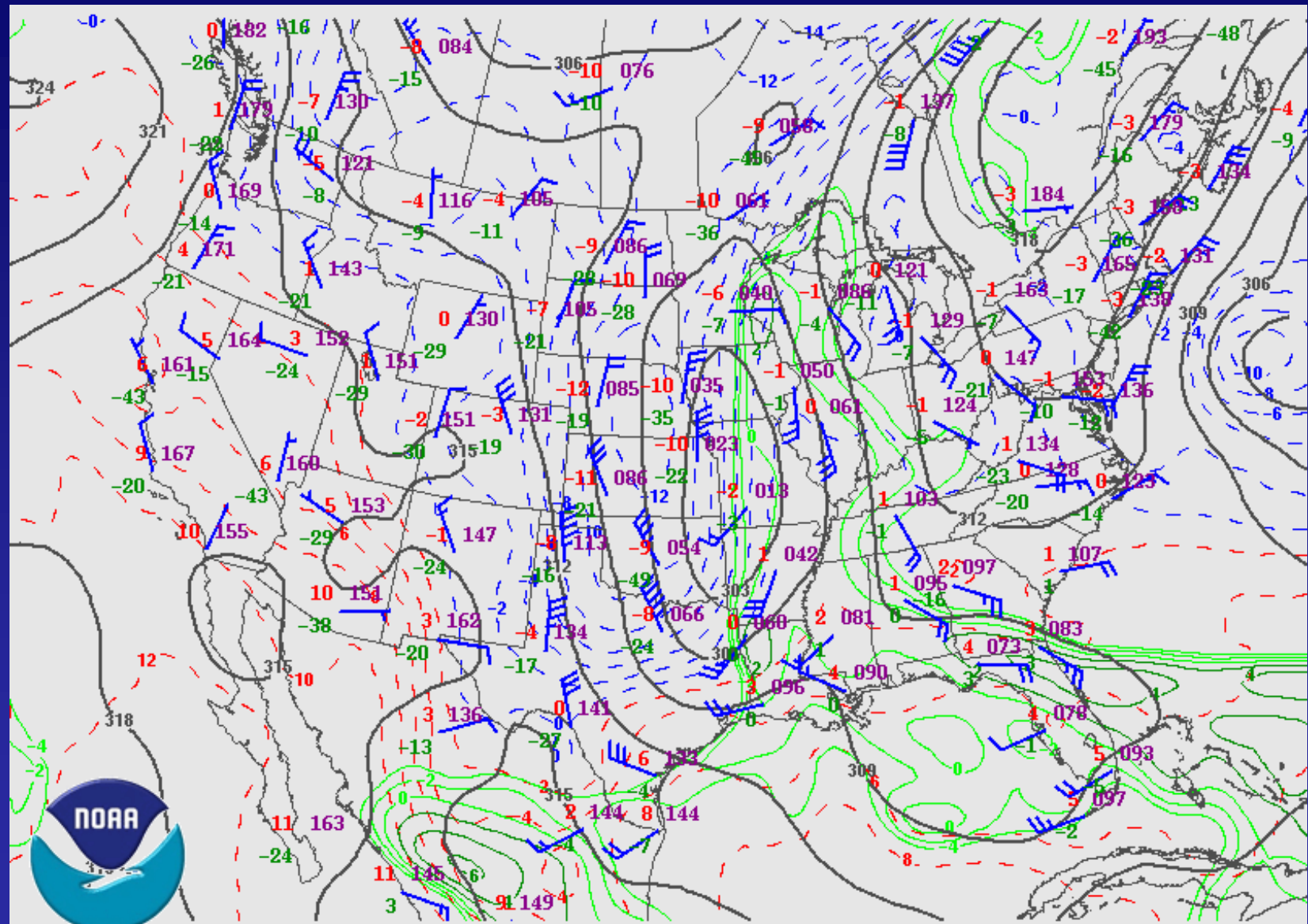
700 mb analysis 02 May 2013 12z



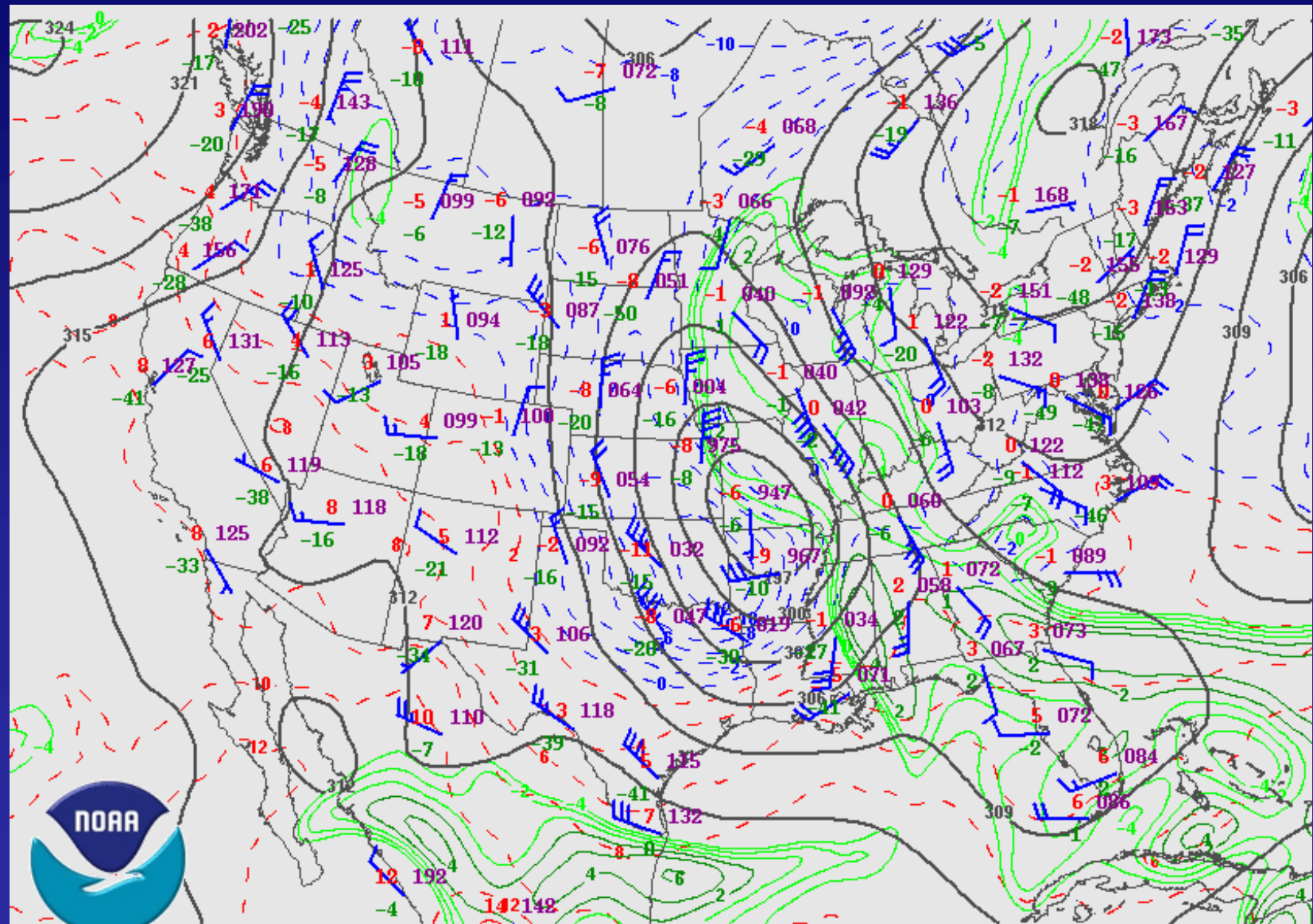
700 mb analysis 03 May 2013 00z



700 mb analysis 03 May 2013 12z

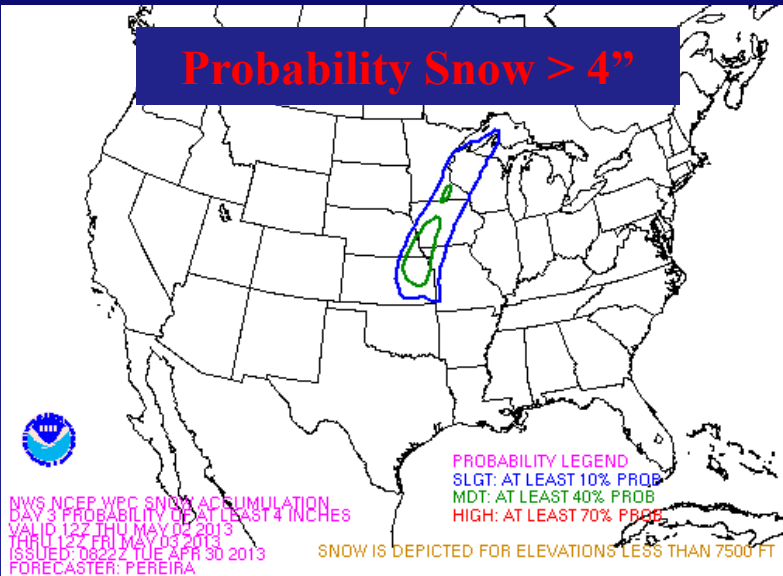


700 mb analysis 04 May 2013 00z

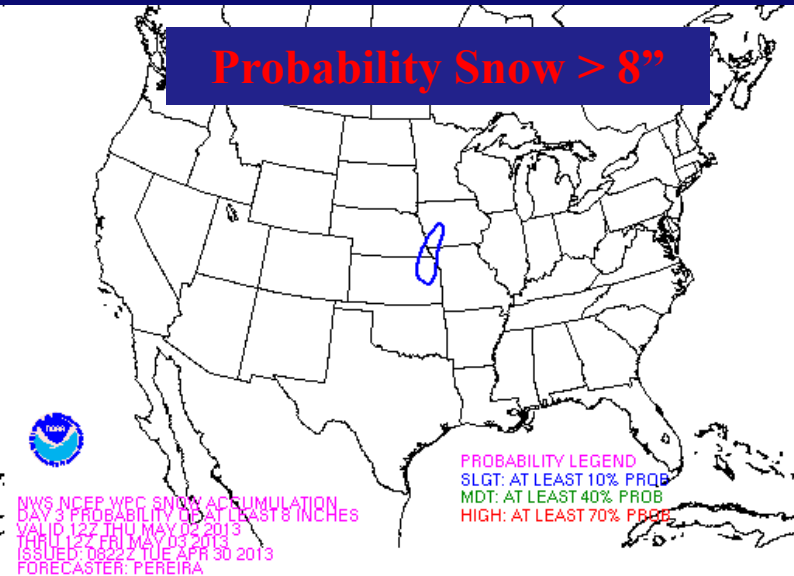


Winter Weather Desk Day 3 forecast valid 12z May 3 2013 issued 0822z Apr 30

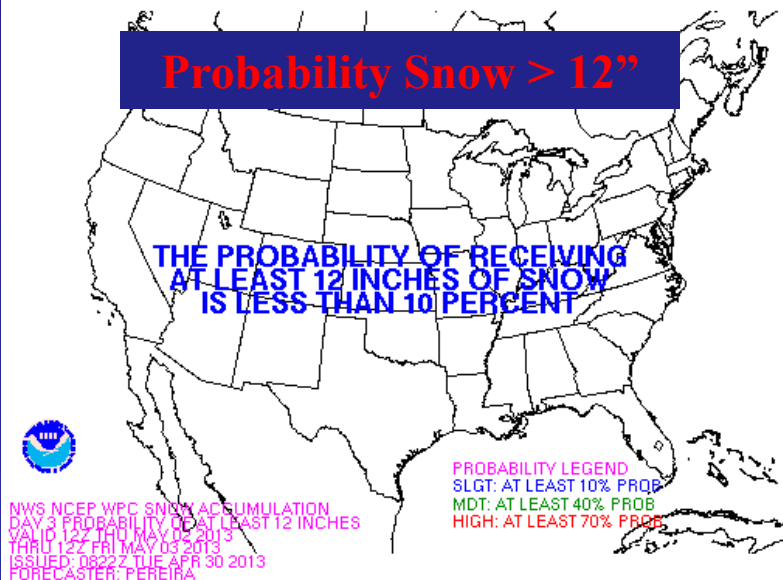
Probability Snow > 4"



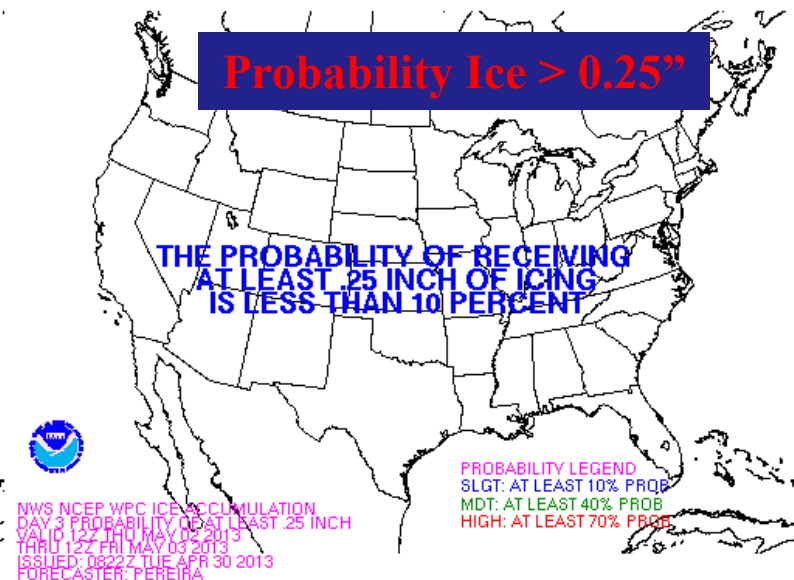
Probability Snow > 8"



Probability Snow > 12"

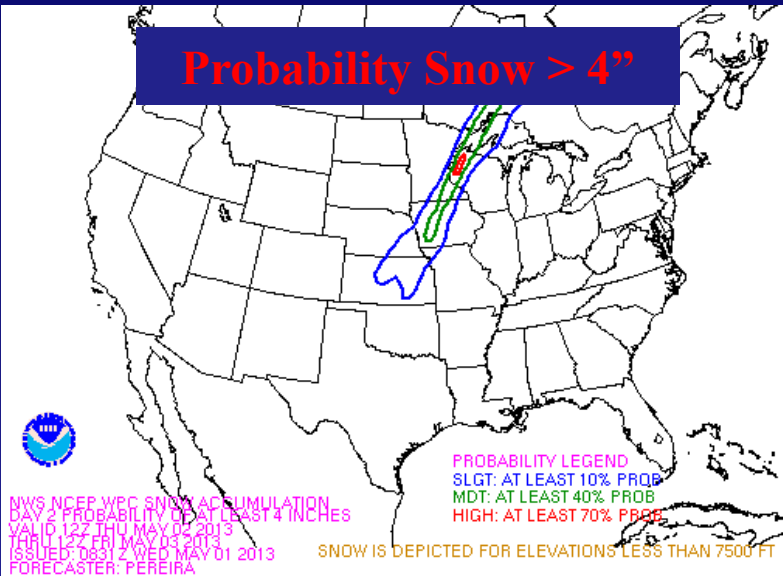


Probability Ice > 0.25"

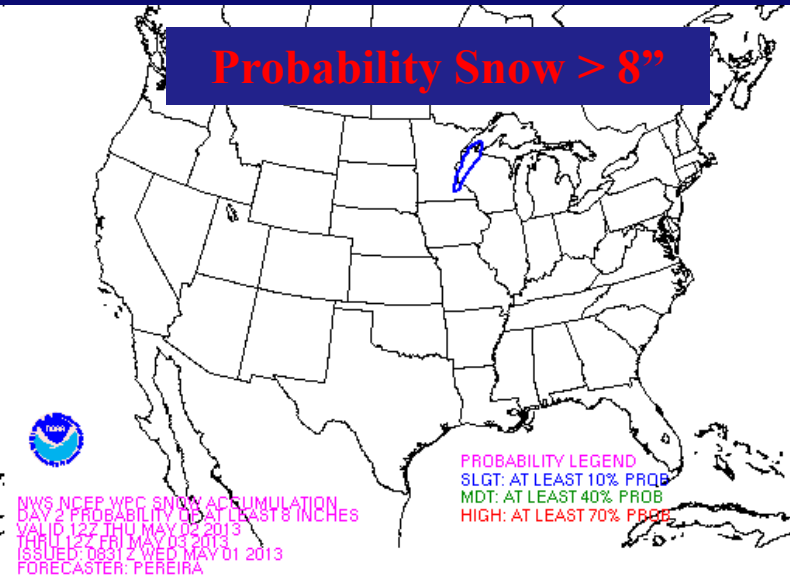


Winter Weather Desk Day 2 forecast valid 12z May 3 2013 issued 0831z May 01

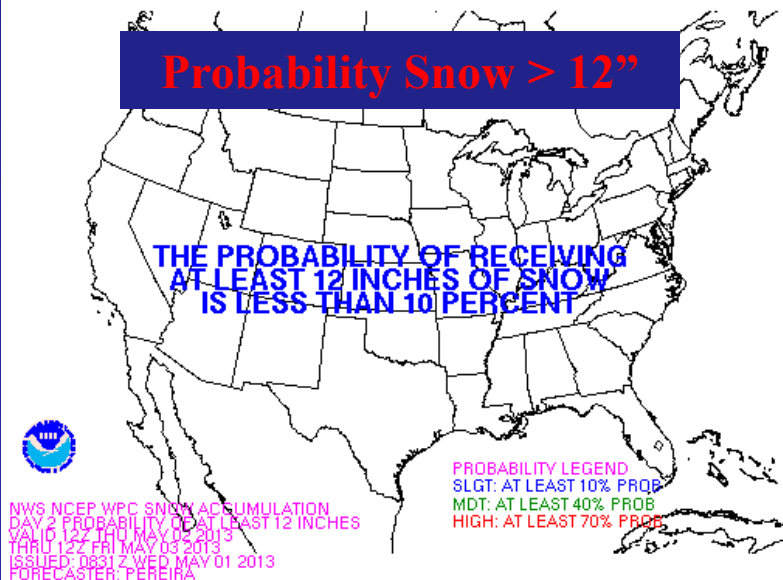
Probability Snow > 4"



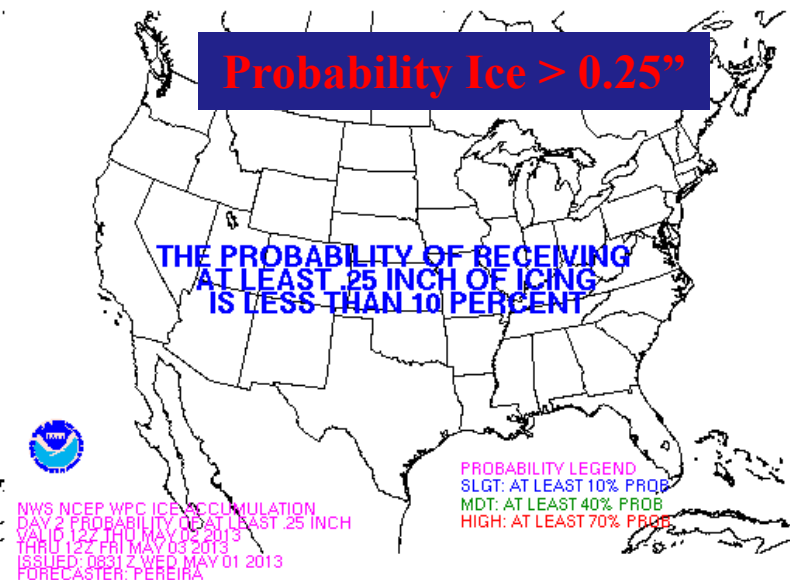
Probability Snow > 8"



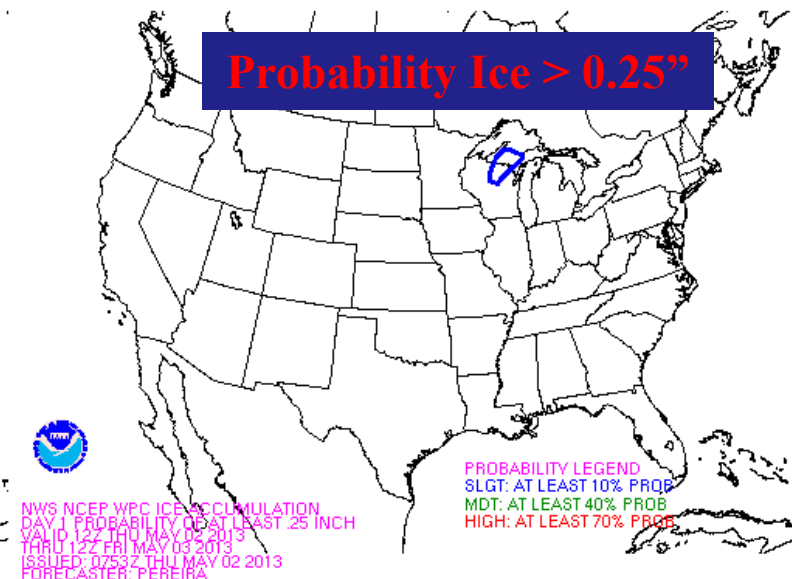
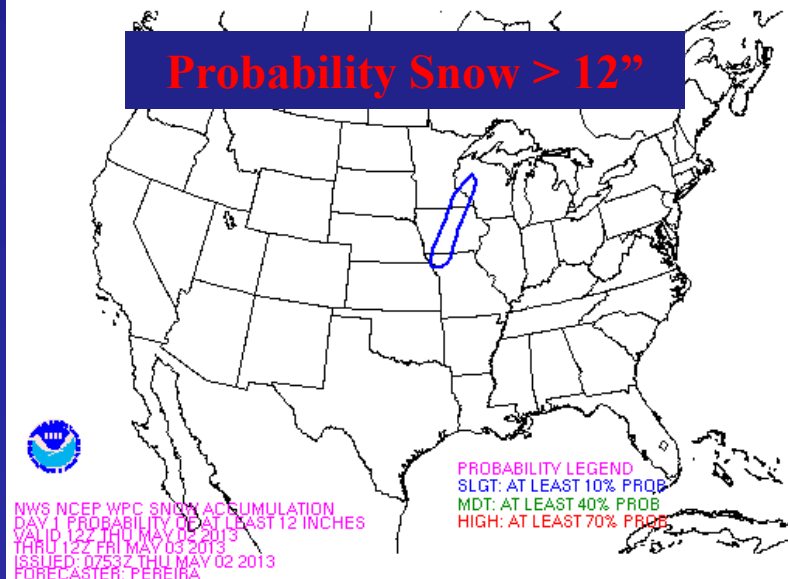
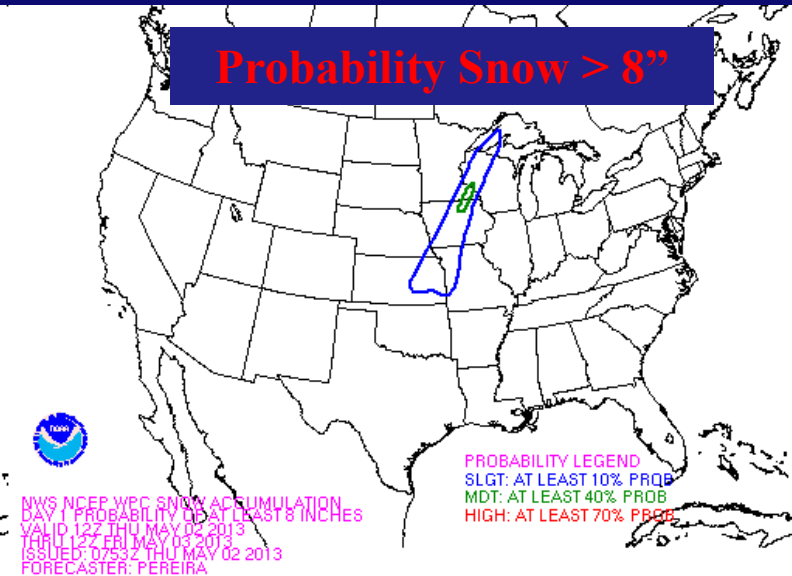
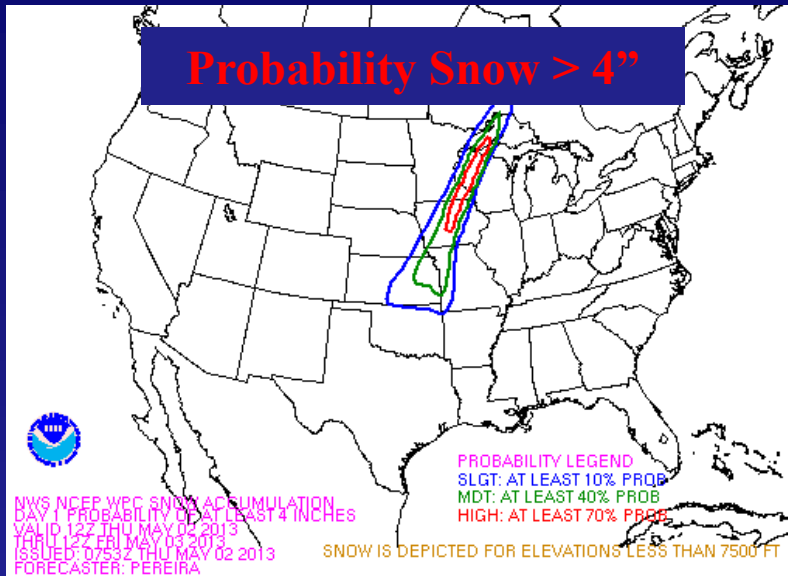
Probability Snow > 12"



Probability Ice > 0.25"



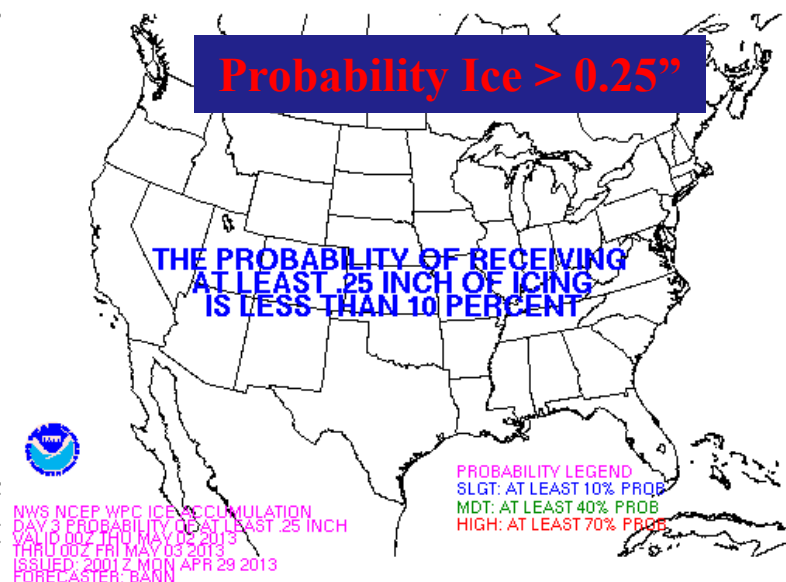
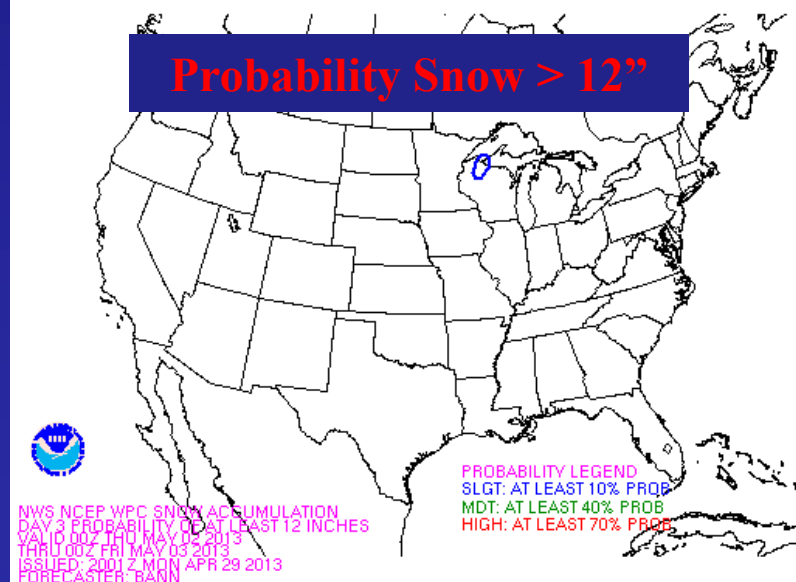
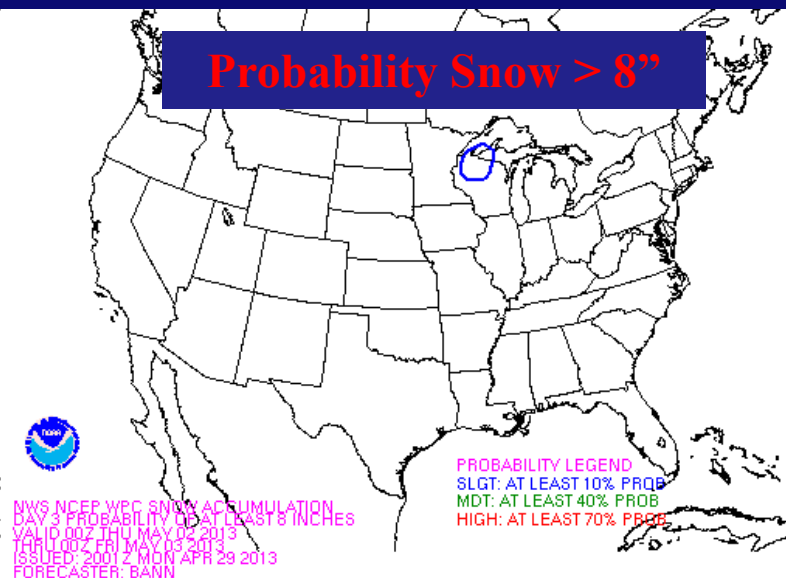
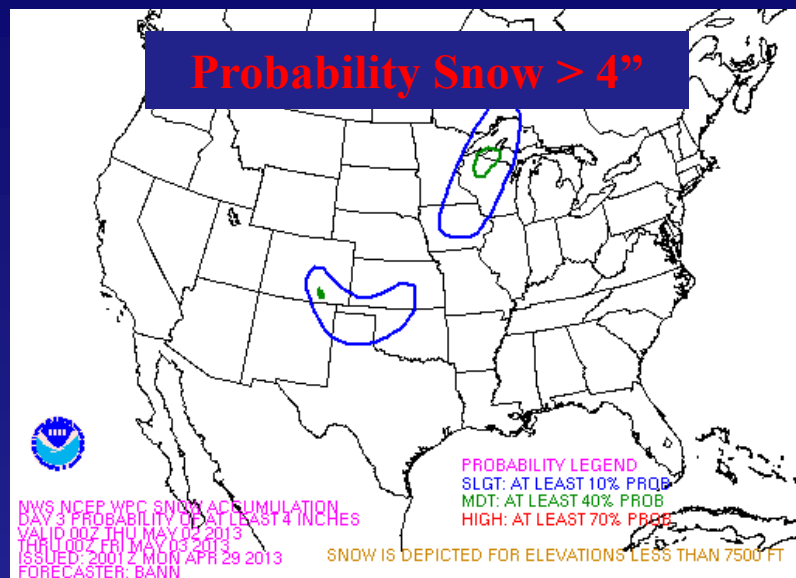
Winter Weather Desk Day 1 forecast valid 12z May 3 2013 issued 0753z May 02



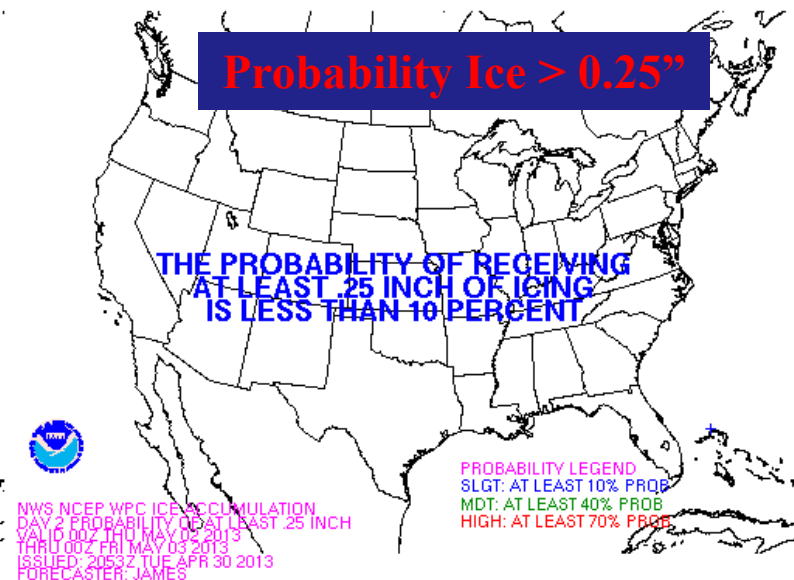
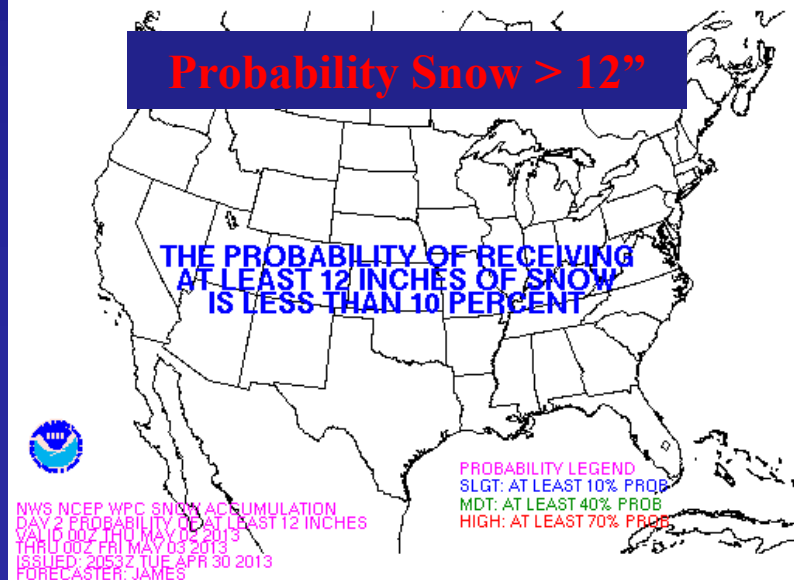
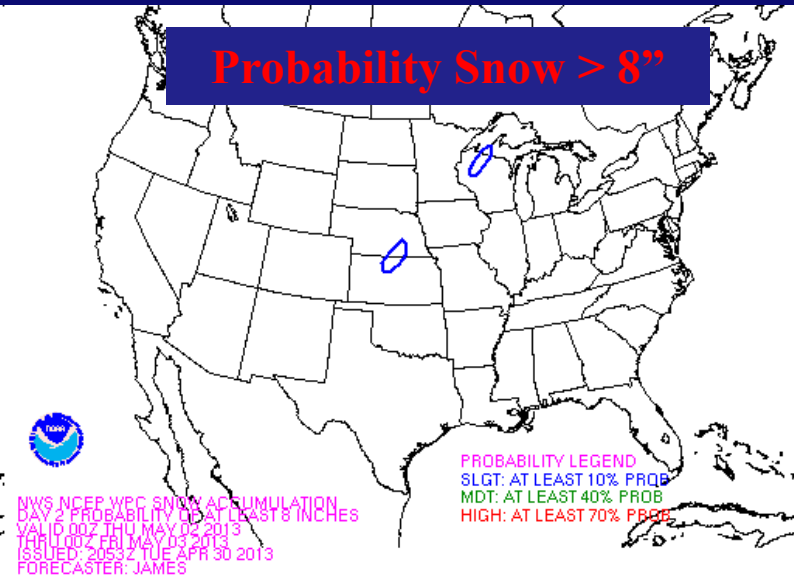
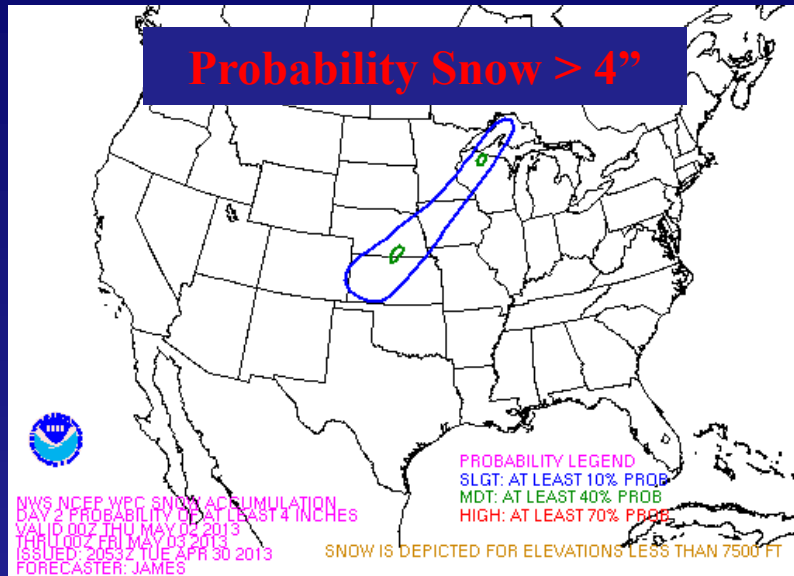
Key lessons
Increased clustering of the model solutions enabled a high risk of heavy snow on the day 1 forecast.

This increased confidence for forecast of an out-of-season heavy snow event.

Winter Weather Desk Day 3 forecast valid 00z May 3 2013 issued 2001z Apr 29



Winter Weather Desk Day 2 forecast valid 00z May 3 2013 issued 2053z Apr 30



Winter Weather Desk Day 1 forecast valid 00z May 3 2013 issued 1831z May 01

